TOSHIBA

FILE NO. A90-0030

SERVICE MANUAL

AIR-CONDITIONER

2-PIPE SUPER MULTI, COOLING ONLY

Outdoor Unit ***MAR-C104M8-1-PE***

Multi Controller ***RBM-Y1034C-PE (3-way)***

RBM-Y1044C-PE (4-way)

2-PIPE SUPER MULTI, HEAT PUMP

Outdoor Unit ***MAR-M104HTM8-1-PE***

Multi Controller ***RBM-Y1034-1-PE (3-way)***

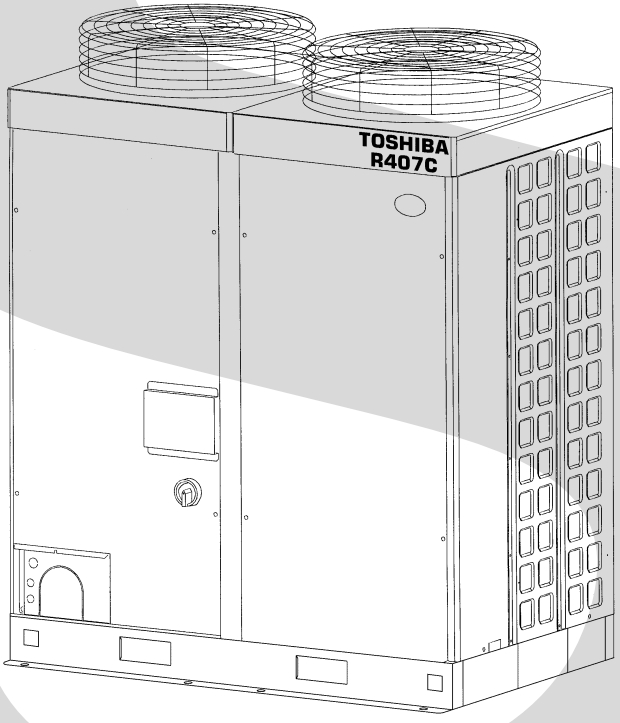
RBM-Y1044-1-PE (4-way)

3-PIPE SUPER MULTI, HEAT PUMP WITH SIMULTANEOUS HEATING AND COOLING

Outdoor Unit ***MAR-F104HTM8-1-PE***

Multi Controller ***RBM-Y1034F-PE (3-way)***

RBM-Y1044F-PE (4-way)



HFC

R407C

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SUMMARY

- The units referred to within this manual conform with the protection requirements of Directives 89/336/EEC Electromagnetic Compatibility and 73/23/EEC Low voltage.
- Operating conditions of the unit are as follows:

Outdoor temperature	-5 ~ 43°C	Cooling	
	-10 ~ 21°C	Heating	(MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE)
Room Temperature	18 ~ 32°C	Cooling	
	15 ~ 29°C	Heating	(MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE)
Room humidity	< 80%	Cooling	

Note 1: Cooling capacity is rated at the following temperature conditions:
Indoor air inlet temperature 27°C DB, 19°C WB.
Outdoor air inlet temperature 35°C DB.

Note 2: Heating capacity is rated at the following temperature conditions:
Indoor air inlet temperature 20°C DB.
Outdoor air inlet temperature 7°C DB, 6°C WB.

Note 3: For details on the Outdoor unit installation, the Indoor units or Remote Controllers refer to the relevant literature. i.e. Installation instructions supplied with the units or Service manuals relevant to the indoor units.

Note 4: Operatives handling refrigerants must be suitably qualified in accordance with local and national codes of practice and statutory requirements.

Note 5: Legislation may regulate the removal of waste refrigerant from the systems. We advise awareness of any regulations and duty of care. Waste refrigerant must NEVER be discharged to atmosphere.

Note 6: Electrical work should be in accordance with all relevant codes of practice and should be carried out by suitably qualified personnel.

Note 7: Metric / Imperial pipe conversion.

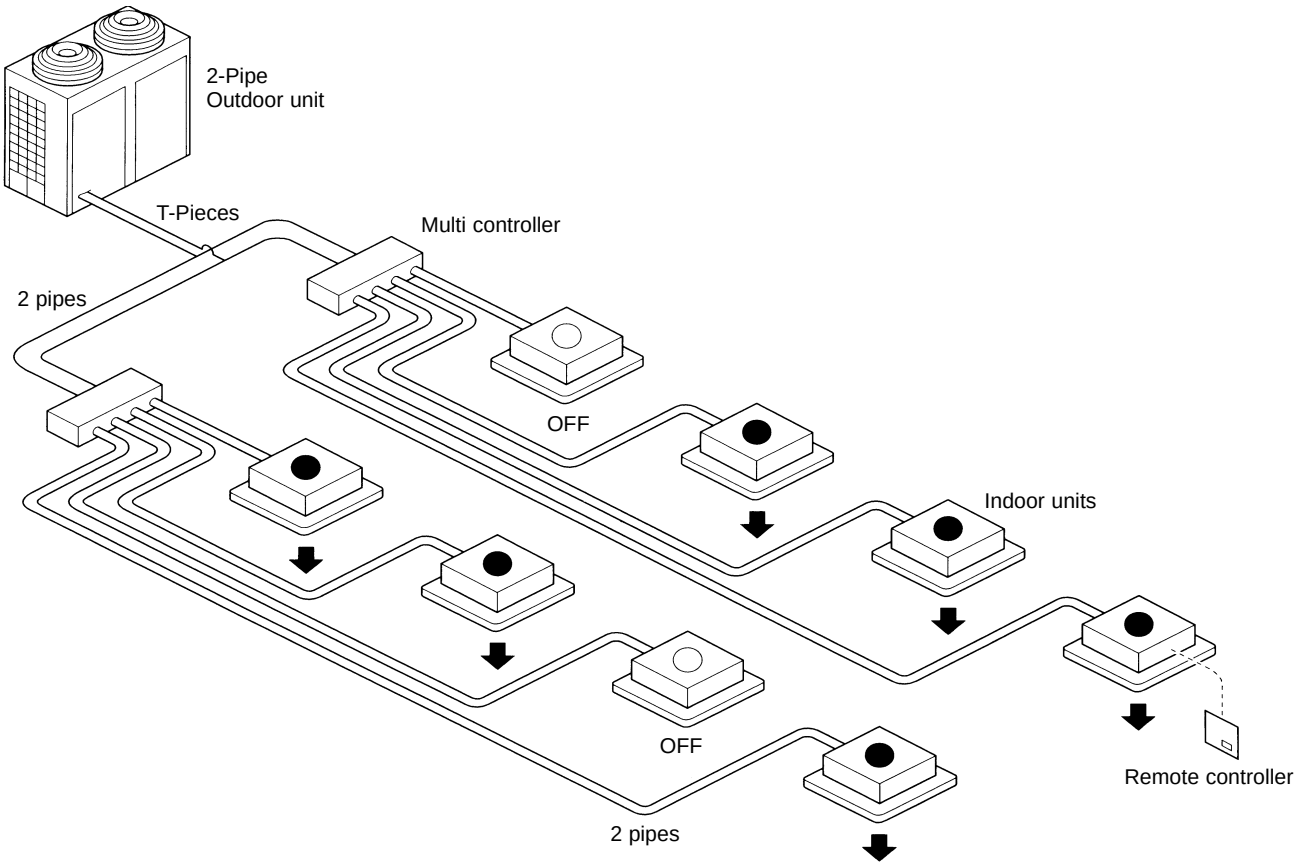
Diameter (mm)	6.4	9.5	12.7	15.9	19.0	22.0	28.6
Nominal diameter (inch)	1/4	3/8	1/2	5/8	3/4	7/8	1 1/8

Note 8: Within this manual, O/D = Outdoor unit, M/C = Multi controller, I/D = Indoor unit, R/C = Remote controller, D.O.L. = Direct on-line compressor.

1. SUPER MULTI SYSTEM BASIC COMPONENTS

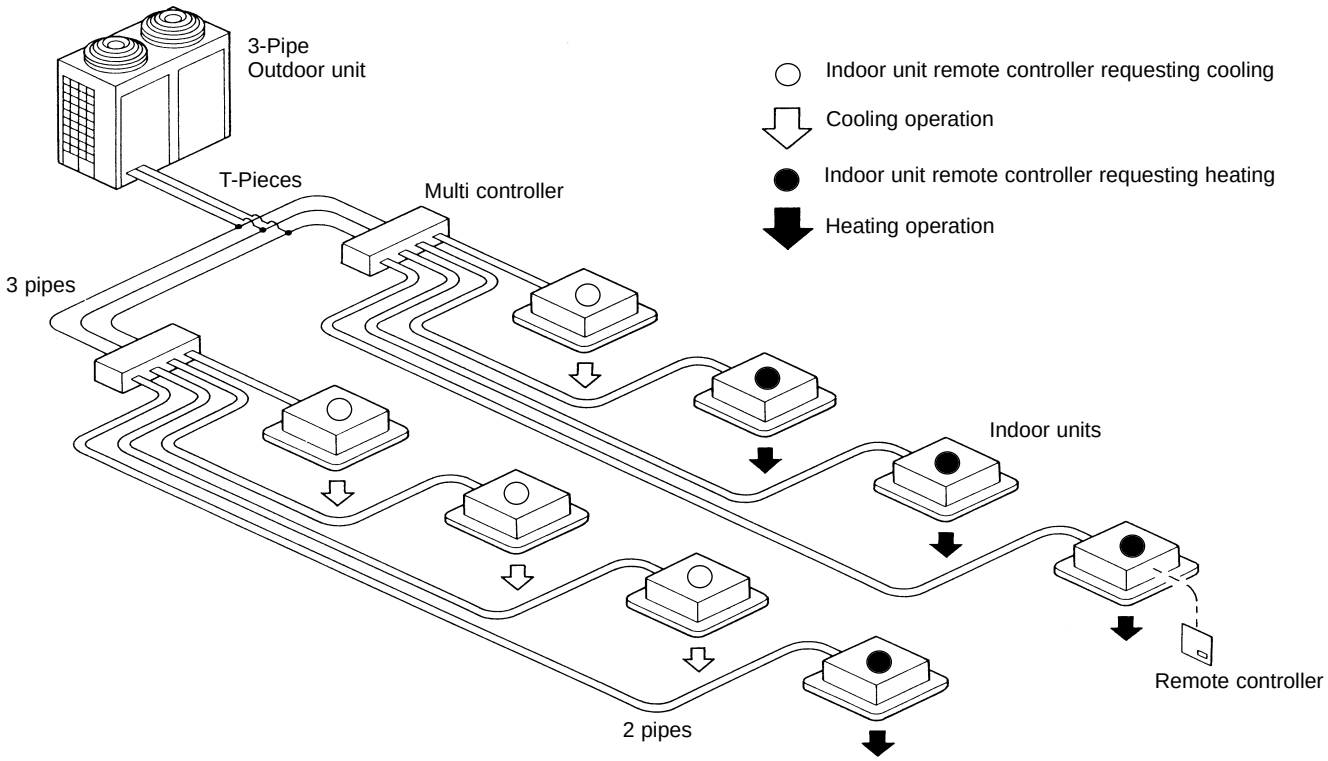
1.1 2-Pipe Heat Pump.

This system allows separate operation of each indoor unit in heating or cooling.
Heating operation has priority over cooling. In the event of an indoor unit requesting cooling operation when another is in heating mode, "STANDBY" will be displayed on the remote controller.



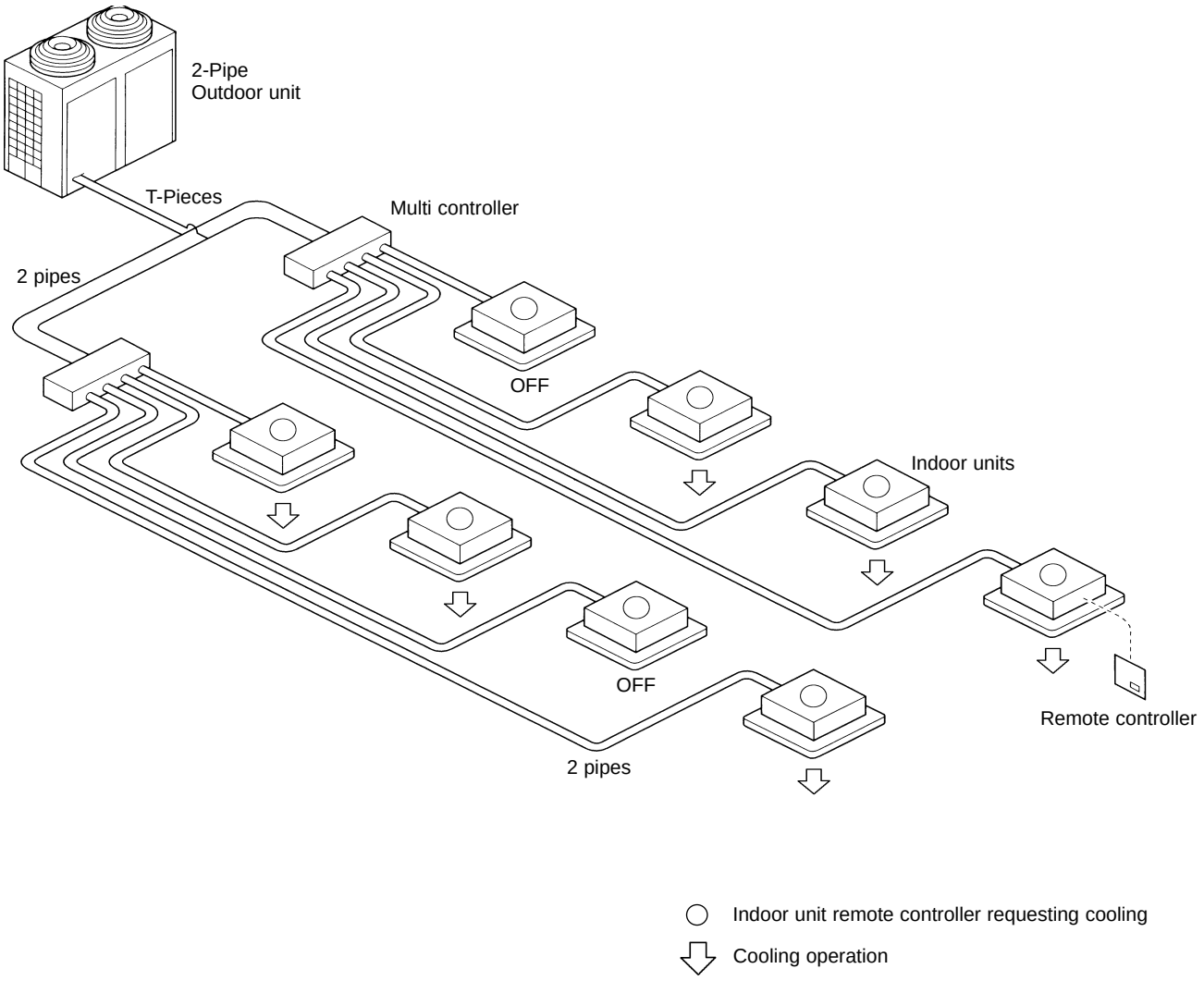
1.2 3-Pipe Heat Pump with simultaneous heating and cooling.

This system allows separate operation of each indoor unit in either heating or cooling simultaneously.



1.3 2-Pipe Cooling only.

This system allows operation of each indoor unit in cooling.



2. OUTLINE OF CONTROL SYSTEM

The refrigerant and electrical systems of the Super multi air conditioner are controlled by the Multi controller and the Outdoor unit microprocessors.

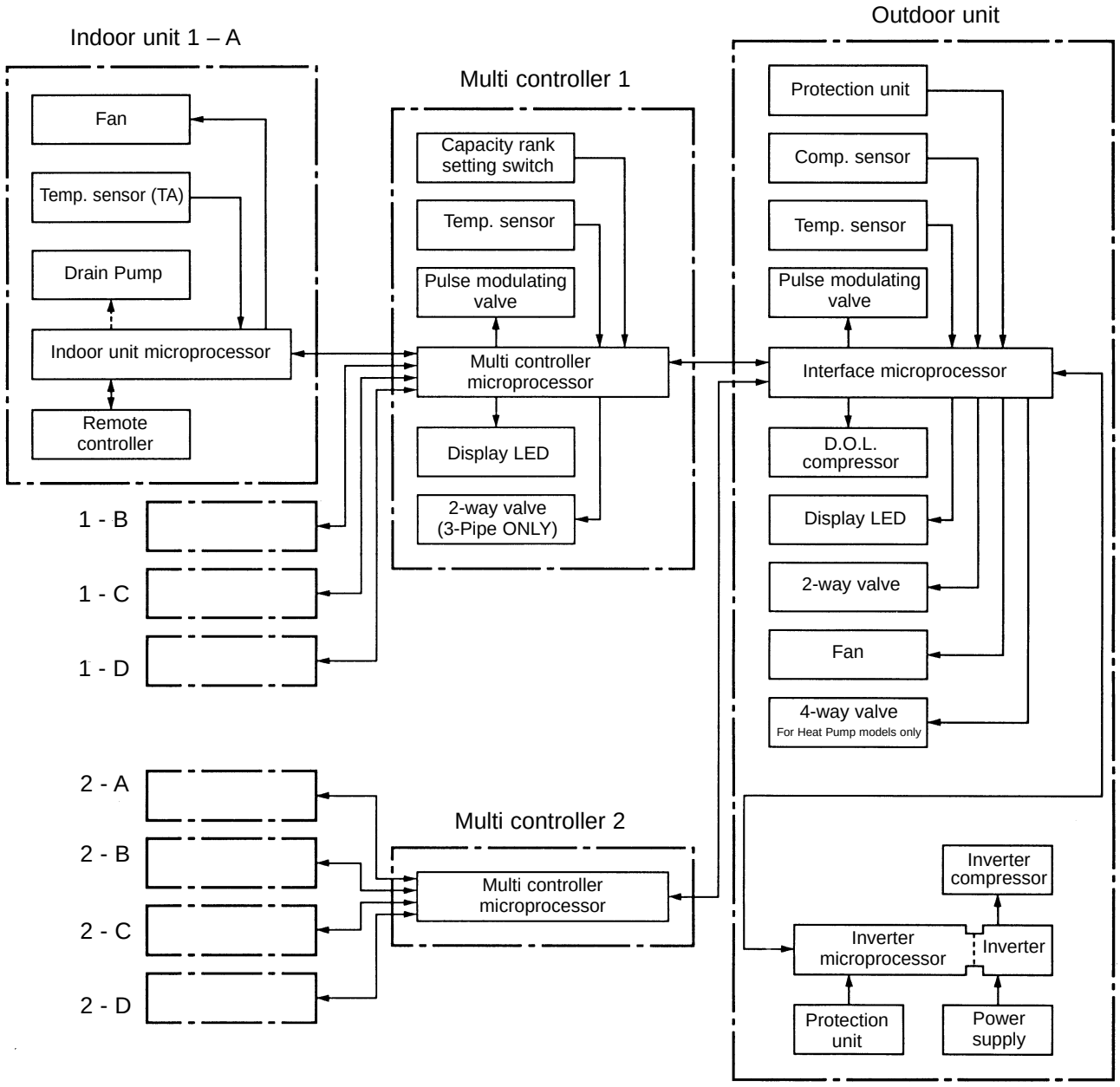
All RAV Heat Pump, R407C, 4 series Indoor units are compatible with the Super multi system. i.e. 1 ~ 5 HP.

For system operation, initially the microprocessor in each Indoor unit calculates the difference between the current room temperature (TA) and the requested temperature which has been set on the Remote controller. A demand signal is determined and transmitted to the Multi controller microprocessor in the form of operation commands. (i.e. ON / OFF, cooling or heating (M104-1 and F104-1 only) operation mode, operation demand frequency).

The Multi controller microprocessor receives operation commands from all Indoor units connected, calculates the accumulative operation command and transmits this information to the Outdoor unit Interface microprocessor.

The Interface microprocessor calculates the capacity required for heating (M104-1 and F104-1 only) or cooling and determines the operation mode of the Outdoor unit and the actual frequency of the compressor.

2.1 Control system diagram.



2.2 Combination of Multi Controllers and Indoor Units.

Each Indoor unit is allocated a code number according to its capacity rank. Refer to the table below.

Capacity Rank of Indoor unit	Code No.
No connection	0
10	2
13	3
16	4
26	6
36	8
46	10

Example: Indoor unit model RAV-364UH-PE, Capacity Rank = 36, Code No. = 8.

(Each Indoor unit Code No. is registered by the capacity rank setting switches on the Multi controller control board).

Multiple Indoor units may be connected to each Outdoor unit, providing the total Indoor code does not exceed the limits shown below.

Outdoor Unit	Maximum No. of Connected Units	Minimum Code No.	Maximum Code No.
10HP 2-PIPE (MAR-C104M8-1-PE) 10HP 2-PIPE (MAR-M104HTM8-1-PE) 10HP 3-PIPE (MAR-F104HTM8-1-PE)	8	2	27

The option is available to use a 3-Way Multi controller (for 3 Indoor units), or a 4-Way Multi controller (for 4 Indoor units). If more than 4 Indoor units are required for an Outdoor unit, 2 multi controllers should be used with T-Piece connections.

Note: It is possible to connect indoor units with a total capacity exceeding the capacity of the outdoor unit by a maximum of 35%.

3. SPECIFICATIONS

3.1 Specification of Outdoor unit.

Model Name				MAR-M104HTM8-1-PE	MAR-F104HTM8-1-PE
	Cooling capacity		(kW)	25.0 (28.0)	
	Heating capacity		(kW)	28.0 (31.5)	
	Power supply			380 – 415V, 3-phase, 50Hz	
Cooling	Operating current		(A)	17.4 (19.1)	
Cooling	Power consumption		(W)	11,800 (12,800)	
Cooling	Power factor		(%)	98 (97)	
Heating	Operating current		(A)	17.7 (15.5)	
Heating	Power consumption		(W)	11,800 (10,500)	
Heating	Power factor		(%)	96 (98)	
	Starting current		(A)	60	
	Starting method			Direct	
	Dimensions (H x W x D)		(mm)	1,530 x 1,290 x 834	
	Net weight		(kg)	346	359
	Colour			Bronze white (Munsell 6Y7.5/1)	
	Compressor	Type		Hermetically sealed (Twin scroll)	
	Compressor	Motor output	(kW)	7.5	
	Compressor	Fan		Propeller fan	
	Compressor	Motor output	(kW)	0.15 x 2	
	Compressor	Air flow volume	(m^3/hr)	10,000	
	Refrigerant (charged weight)		(kg)	R407C (16.0)	R407C (19.0)
	Noise	Sound Power Level (SWL)	(dB(A))	70	
	Noise	Sound Pressure Level (SPL)	(dB(A))	63	
	Liquid		(mm)	ø15.9	
	Discharge gas		(mm)	–	ø19.0
	Suction gas		(mm)	ø28.6	
	Coupler style	Liquid		Flare connection	
	Coupler style	Discharge gas		–	Flare connection
	Coupler style	Suction gas		Brazing connection	
	Max. equivalent piping length		(m)	120	
	Max. actual piping length		(m)	100	
	Max. piping head		(m)	50: When the outdoor unit is installed above. 20: When the outdoor unit is installed below.	
	Crank case heater		(W)	74	

Model Name			MAR-C104M8-1-PE
Cooling capacity		(kW)	25.0 (28.0)
Power supply			380 – 415V, 3-phase, 50Hz
Cooling	Operating current	(A)	17.4 (19.1)
	Power consumption	(W)	11,800 (12,800)
	Power factor	(%)	98 (97)
Starting current		(A)	60
Starting method			Direct
Dimensions (H x W x D)		(mm)	1,530 x 1,290 x 834
Net weight		(kg)	324
Colour			Bronze white (Munsell 6Y7.5/1)
Compressor	Type		Hermetically sealed (Twin scroll)
	Motor output	(kW)	7.5
Fan assembly	Fan		Propeller fan
	Motor output	(kW)	0.15 x 2
	Air flow volume	(m^3/hr)	10,000
Refrigerant (charged weight)		(kg)	R407C (9.0)
Noise	Sound Power Level (SWL)	(dB(A))	70
	Sound Pressure Level (SPL)	(dB(A))	60
Liquid		(mm)	ø15.9
Suction gas		(mm)	ø28.6
Coupler style	Liquid		Flare connection
	Suction gas		Brazing connection
Max. equivalent piping length		(m)	120
Max. actual piping length		(m)	100
Max. piping head		(m)	50: When the outdoor unit is installed above. 20: When the outdoor unit is installed below.
Crank case heater		(W)	74

The specification shown in ( ) denotes operation with the maximum capacity of indoor units connected (i.e. 135% capacity of the outdoor unit).

3.2 Specifications of Outdoor unit Refrigerant Cycle Parts.

Model Name			MAR-M104HTM8-1-PE	MAR-F104HTM8-1-PE
Comp-ressor motor	Model name		MG1300CW-20	
	Motor type		3-phase induction motor	
	Power supply		380 – 415V, 3-phase, 50Hz	
	Output	(kW)	7.5	
	Pole	(P)	2/2 (Inverter side/Non-inverter side)	
	Coil resistance	(Ω)	1.49/2.51 (Inverter side/Non-inverter side)	
	Compressor oil name		NISSEKI RB68AF	
	Amount of oil	(cc)	7,000	
Fan motor	Model name		STF-200-150C	
	Motor type		1-phase, induction motor	
	Power supply		220 – 240V, 1-phase, 50Hz	
	Output	(W)	150	
	Supply current	(A)	1.12 ~ 1.44	
	Pole	(P)	6	
	Inner over-load relay		OFF: 115 ± 5°C	
High pressure switch	Model name		20PS-B (Inverter side), 20PS-G (Non-inverter side)	
	Operating pressure	(kgf/cm^2G)	Operation 30, Reset 23	
Low pressure switch	Model name		20PS-1	
	Operating pressure	(kgf/cm^2G)	Operation 0.25, Reset 1.5	
4-way valve			CHV-0712, Coil AC240V	
Compressor case heater			AC 240V, 74W	
Pressure sensor			Model name: NTP-Q250TF-2 Input voltage: DC 12V Output voltage: DC 0.5 – 4.5V	
Discharge temperature sensor			At 25°C = 50kΩ, 50°C = 17.9kΩ, 100°C = 3.35kΩ	
Suction temperature sensor			At 0°C = 32.8kΩ, 25°C = 10kΩ, 50°C = 3.6kΩ	
Outdoor air temperature sensor			At 0°C = 32.8kΩ, 25°C = 10kΩ, 50°C = 3.6kΩ	
Pulse modulating valve (For bypass)			EV18RC2, Coil DC 12V	
Pulse modulating valve			–	EV23RC8, Coil DC
2-way valve			NEV202DXF, Coil AC 240V	
2-way valve			–	RP100-03, Coil AC

Model Name			MAR-C104M8-1-PE
Comp-ressor motor	Model name		MG1300CW-20
	Motor type		3-phase induction motor
	Power supply		380 – 415V, 3-phase, 50Hz
	Output	(kW)	7.5
	Pole	(P)	2/2 (Inverter side/Non-inverter side)
	Coil resistance	(Ω)	1.49/2.51 (Inverter side/Non-inverter side)
	Compressor oil name		NISSEKI RB68AF
	Amount of oil	(cc)	7,000
Fan motor	Model name		STF-200-150C
	Motor type		1-phase, induction motor
	Power supply		220 – 240V, 1-phase, 50Hz
	Output	(W)	150
	Supply current	(A)	1.12 ~ 1.44
	Pole	(P)	6
	Inner over-load relay		OFF: 115 ± 5˚C
High pressure switch	Model name		20PS-B (Inverter side), 20PS-G (Non-inverter side)
	Operating pressure	(kgf/cm^2G)	Operation 30, Reset 23
Low pressure switch	Model name		20PS-1
	Operating pressure	(kgf/cm^2G)	Operation 0.25, Reset 1.5
Compressor case heater			AC 240V, 74W
Pressure sensor			Model name: NTP-Q250TF-2 Input voltage: DC 12V Output voltage: DC 0.5 – 4.5V
Discharge temperature sensor			At 25˚C = 50kΩ, 50˚C = 17.9kΩ, 100˚C = 3.35kΩ
Suction temperature sensor			At 0˚C = 32.8kΩ, 25˚C = 10kΩ, 50˚C = 3.6kΩ
Pulse modulating valve (For bypass)			EV18RC2, Coil DC 12V
2-way valve			NEV202DXF, Coil AC 240V

3.3 Specifications of Outdoor unit Inverter Assembly Parts.

Model Name	MAR-M104HTM8-1-PE	MAR-F104HTM8-1-PE
Power supply	380 – 415V, 3-phase, 50Hz	
Output voltage at operating frequency of 60Hz	AC 266V	
IGBT	MG50Q6ES11	
Relay	LY1F (AC 240V)	
Fan motor running capacitor	EAG45M605UF1, 6μF450V	
Diode	SR130G-160	
AC noise filter	ZSG2208-02, 8A, 250V	
DC noise filter	LF215AV, 15A, 716V	
Power supply rectifier capacitor	LNT2G222KSMCTF, 2200μF/400V	
Fuse	20A	
Electronic starter	912X25E101YV20	
Reactor	CH-26-T, 6.2mH, 18A	
Fan motor relay	G2R217PV	
Control relay	G4U-112P	
Magnetic contactor for compressor (Inverter side)	13A	
Magnetic contactor for compressor (Non-inverter side)	15A	
Transformer (Inverter)	FT70	
Transformer (Interface)	FT69	
Power supply terminal plate	AC600V, 60A	
PC board (Inverter)	MCC-1251 (INV-M-E)	MCC-1251 (INV-F-E)
PC board assembly (Interface)	MCC-1211	MCC-1223
PC board (Gate)	MCC-1252	
Cooling fan	–	3650EXV-5, 220-240V

Model Name	MAR-C104M8-1-PE
Power supply	380 – 415V, 3-phase, 50Hz
Output voltage at operating frequency of 60Hz	AC 266V
IGBT	MG50Q6ES11
Relay	LY1F (AC 240V)
Fan motor running capacitor	EAG45M605UF1, 6μF450V
Diode	SR130G-160
AC noise filter	ZSG2208-02, 8A, 250V
DC noise filter	LF215AV, 15A, 716V
Power supply rectifier capacitor	LNT2G222KSMCTF, 2200μF/400V
Fuse	20A
Electronic starter	912X25E101YV20
Reactor	CH-26-T, 6.2mH, 18A
Fan motor relay	G2R217PV
Control relay	G4U-112P
Magnetic contactor for compressor (Inverter side)	13A
Magnetic contactor for compressor (Non-inverter side)	15A
Transformer (Inverter)	FT70
Transformer (Interface)	FT69
Power supply terminal plate	AC600V, 60A
PC board (Inverter)	MCC-1251 (INV-M-E)
PC board assembly (Interface)	MCC-1211
PC board (Gate)	MCC-1252

3.4 Specification of 2-Pipe Multi Controller Parts.

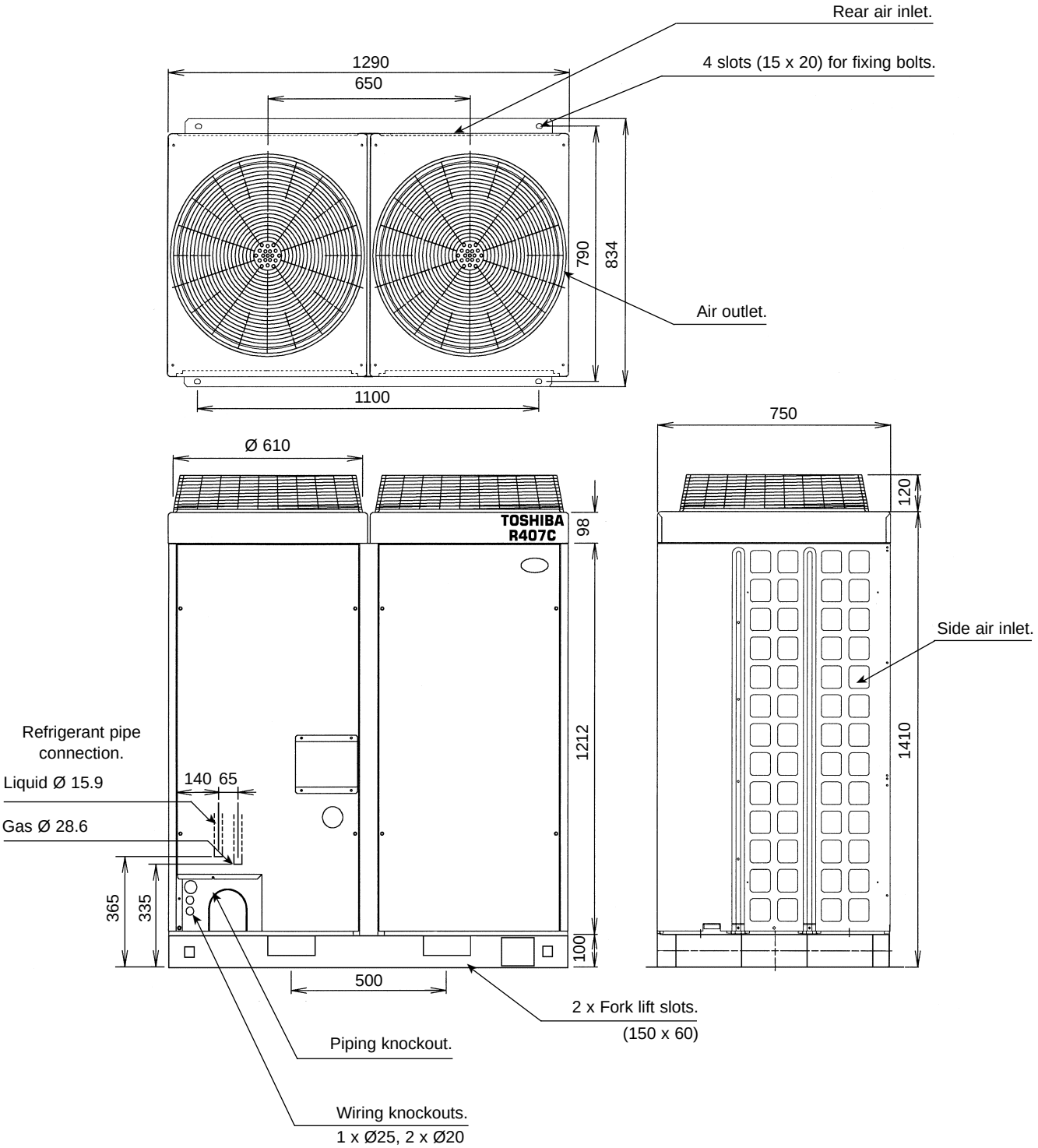
Model Name		RBM-Y1034C-PE RBM-Y1034-1-PE	RBM-Y1044C-PE RBM-Y1044-1-PE
Pulse modulating valve		EV23RC7, Coil DC 12V	
Temperature sensor		At 0°C = 32.8kΩ, 25°C = 10kΩ, 50°C = 3.6kΩ	
Float switch		FS-085-0031	
Power supply transformer	Model name	1401008301	
	Specification	Primary side:AC240V, Secondary side:AC12V	
Relay (PC board)		G2R-117P, Coil DC 12V	
Heater		10.4 W/m	
		50W	65W
Thermal fuse for heater		Cut out at 139°C	
Heater fuse		T1A	

3.5 Specification of 3-Pipe Multi Controller Parts.

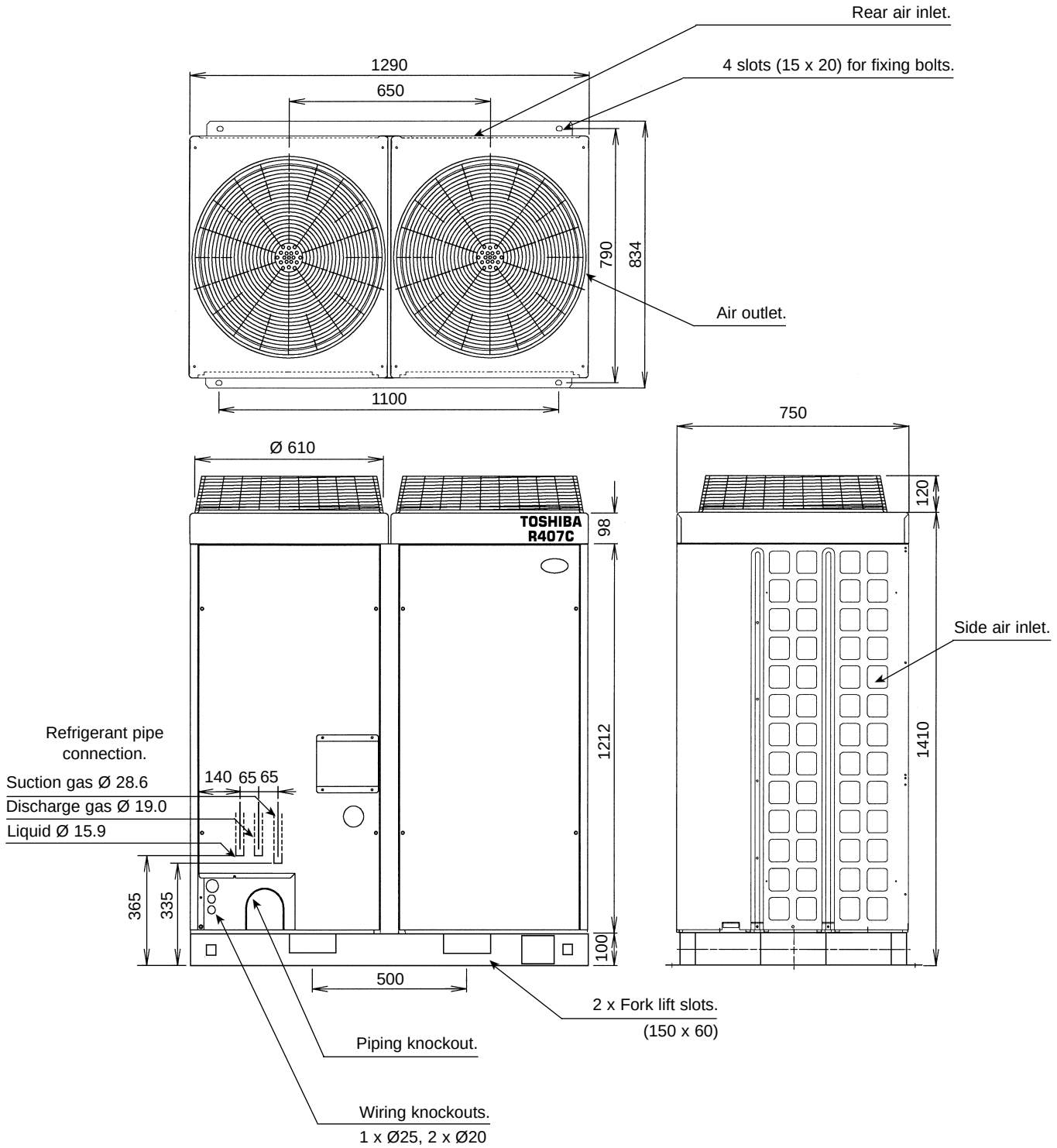
Model Name		RBM-Y1034F-PE	RBM-Y1044F-PE
Pulse modulating valve		EV23RC7, Coil DC 12V	
Temperature sensor		At 0°C = 32.8kΩ, 25°C = 10kΩ, 50°C = 3.6kΩ	
Float switch		FS-085-0031	
Power supply transformer	Model name	1401008301	
	Specification	Primary side:AC240V, Secondary side:AC12V	
Relay (PC board)		G2R-117P, Coil DC 12V	
Heater		10.4 W/m	
		50W	65W
Thermal fuse for heater		Cut out at 139°C	
Heater fuse		T1A	
Discharge gas side 2-way valve		RP100-03, Coil AC240V	
Suction gas side 2-way valve		REV-1506DXFQ6, Coil AC240V	
2-way valve		NEV202DXF-AC240V	
2-way valve		NEV603DXF-AC240V	

4. CONSTRUCTION VIEWS

4.1 2-Pipe Outdoor Unit (MAR-C104M8-1-PE/MAR-M104HTM8-1-PE).

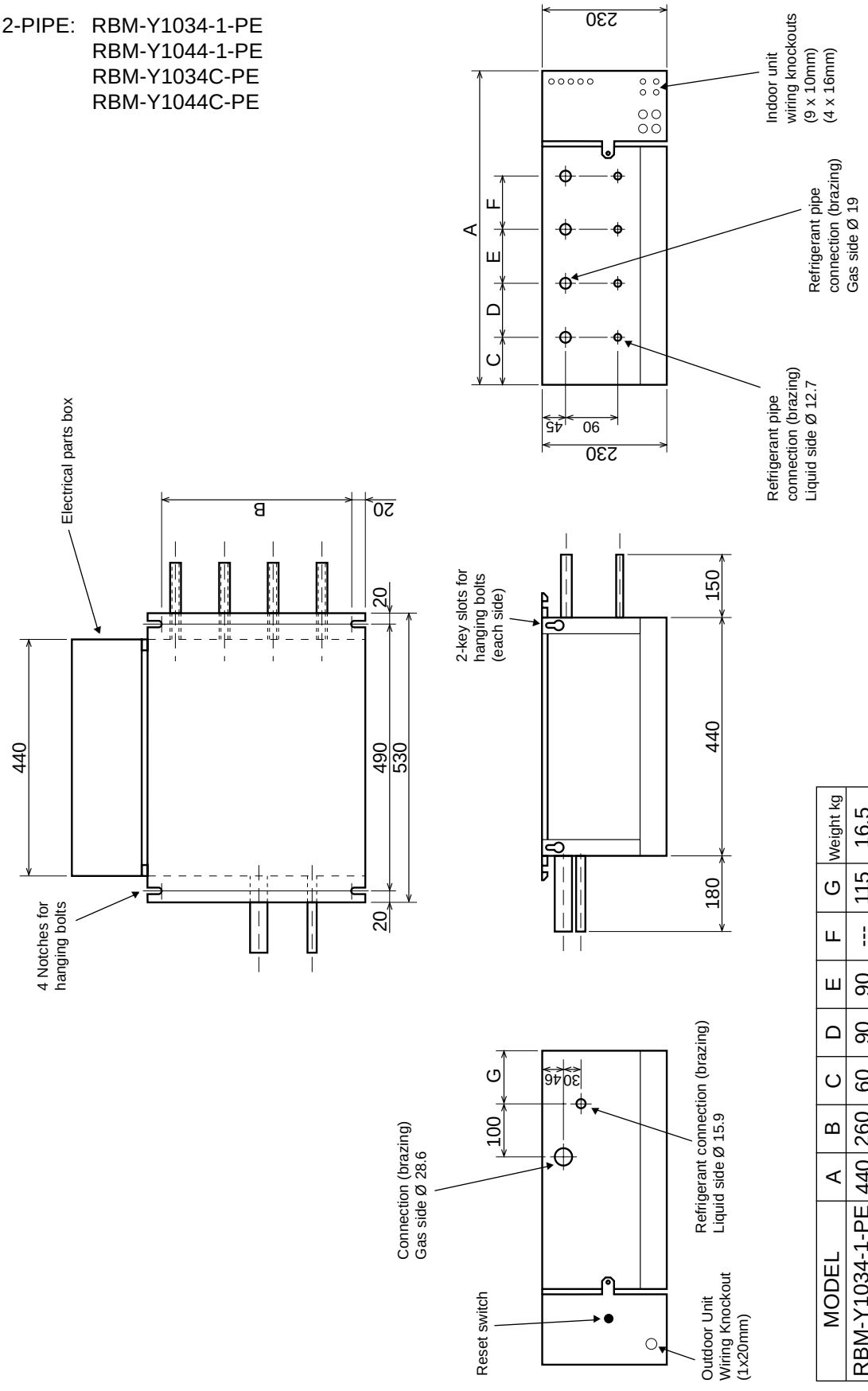


4.2 3-Pipe Outdoor Unit (MAR-F104HTM8-1-PE).

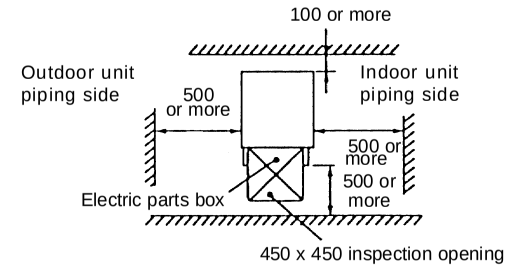


4.3 Multi Controllers.

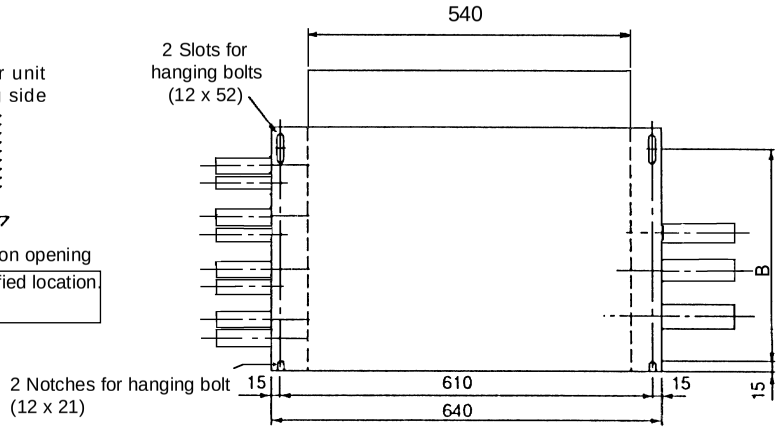
2-PIPE: RBM-Y1034-1-PE
RBM-Y1044-1-PE
RBM-Y1034C-PE
RBM-Y1044C-PE

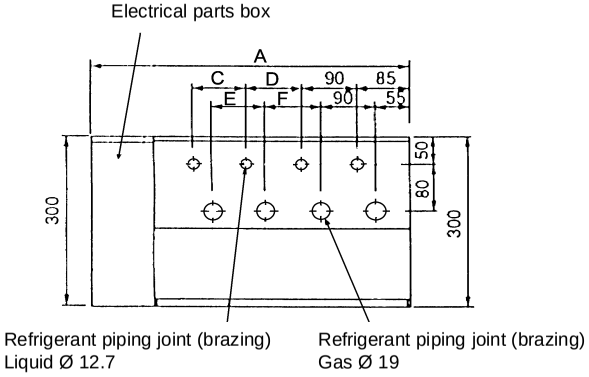


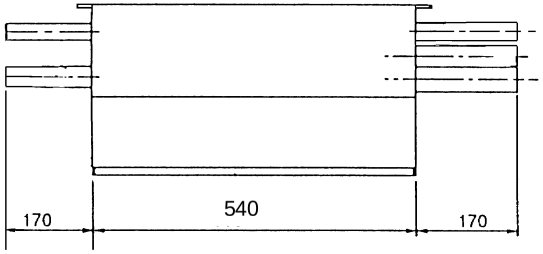
MODEL	A	B	C	D	E	F	G	Weight kg
RBM-Y1034-1-PE	440	260	60	90	90	---	115	16.5
RBM-Y1044-1-PE	540	350	90	90	90	90	205	19.5
RBM-Y1034C-PE	440	260	60	90	90	---	115	16.5
RBM-Y1044C-PE	540	350	90	90	90	90	205	19.5

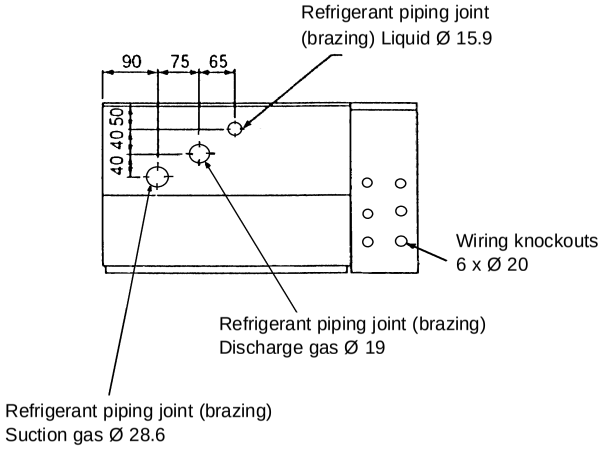


Note: Make an inspection opening at the specified location. This is required for testing and servicing.







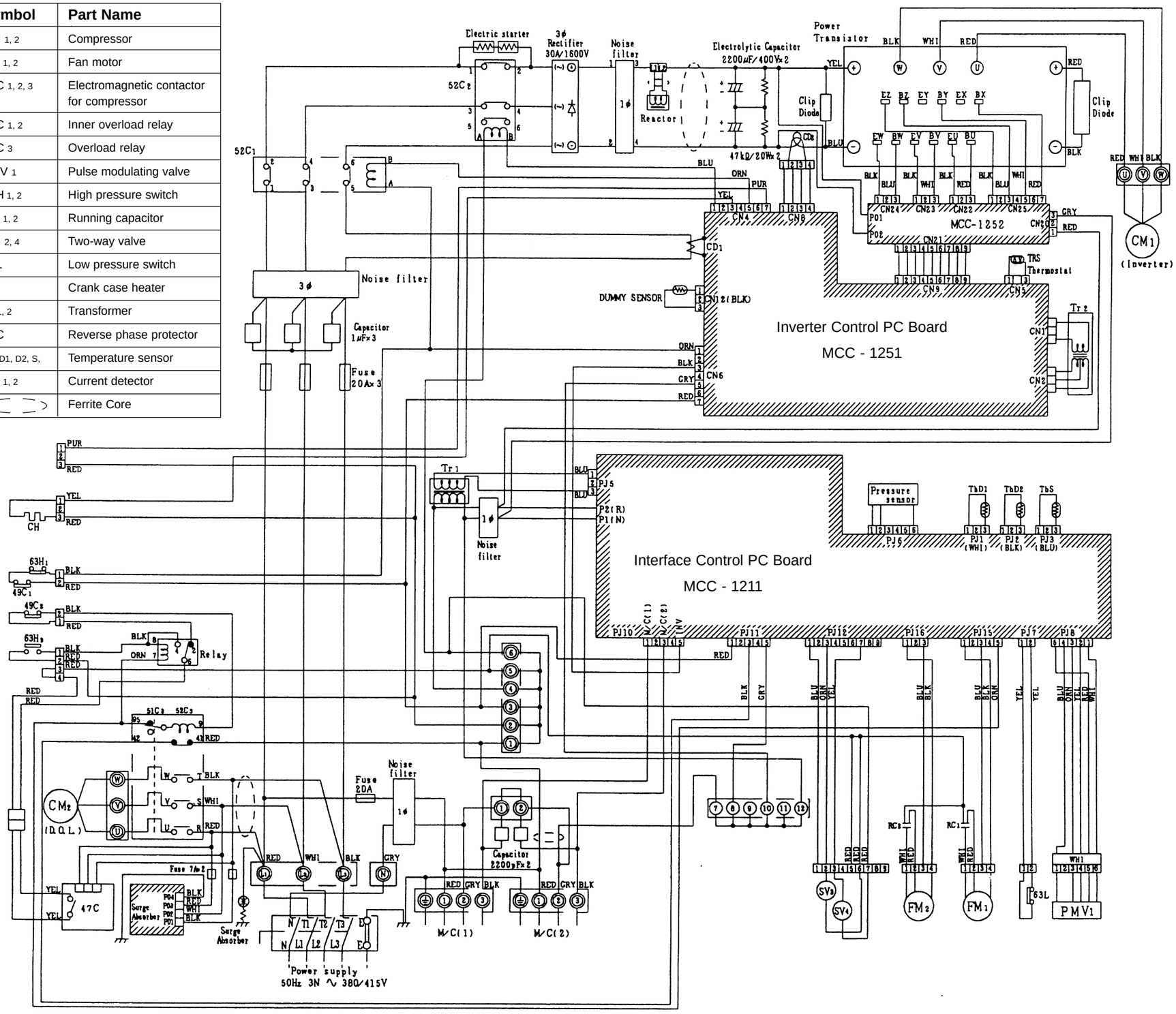

Refrigerant piping joint (brazing) Liquid Ø 15.9
90
75
65
40 40 50
Wiring knockouts 6 x Ø 20
Refrigerant piping joint (brazing) Discharge gas Ø 19
Refrigerant piping joint (brazing) Suction gas Ø 28.6

MODEL	A	B	C	D	E	F	G	Weight Kg
RBM-Y1034F-PE	460	300	---	90	---	90	---	30
RBM-Y1044F-PE	530	370	90	90	90	90	---	34

5. WIRING DIAGRAMS

5.1 2-Pipe Outdoor unit (MAR-C104M8-1-PE).

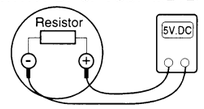
Symbol	Part Name
CM 1, 2	Compressor
FM 1, 2	Fan motor
52C 1, 2, 3	Electromagnetic contactor for compressor
49C 1, 2	Inner overload relay
51C 3	Overload relay
PMV 1	Pulse modulating valve
63H 1, 2	High pressure switch
RC 1, 2	Running capacitor
SV 2, 4	Two-way valve
63L	Low pressure switch
CH	Crank case heater
Tr 1, 2	Transformer
47C	Reverse phase protector
Th D1, D2, S,	Temperature sensor
CD 1, 2	Current detector
( )	Ferrite Core



Notes :
1. The dashed lines indicate wiring on site.
2. ◎ and □ indicate terminal blocks, and numbers within them are terminal numbers.
3. ▨ indicates a printed circuit board.

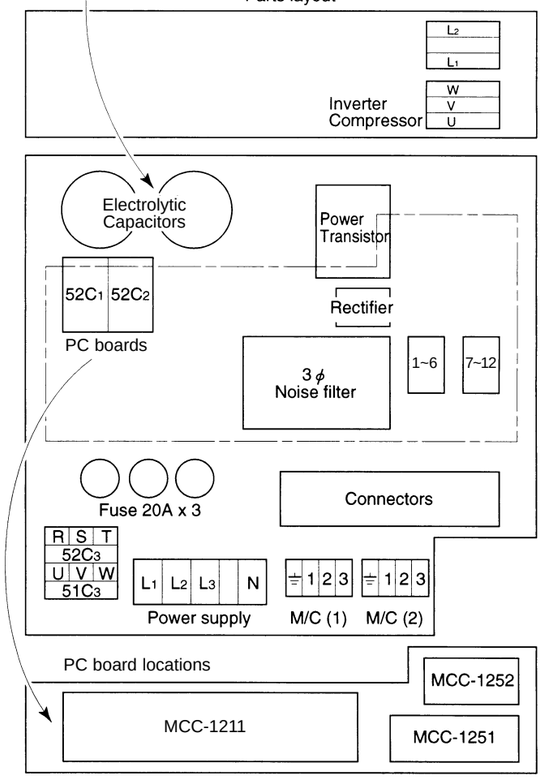
DANGER

THE ELECTROLYTIC CAPACITORS IN THIS PANEL ARE CHARGED TO 600 VOLTS D. C.
BEFORE SERVICING, TURN OFF THE POWER SUPPLY AND ALLOW AT LEAST 20 MINUTES FOR THE CAPACITORS TO DISCHARGE TO A SAFE LEVEL OF 5 VOLTS D. C. OR LESS. TEST WITH A D. C. VOLT METER AS SHOWN.



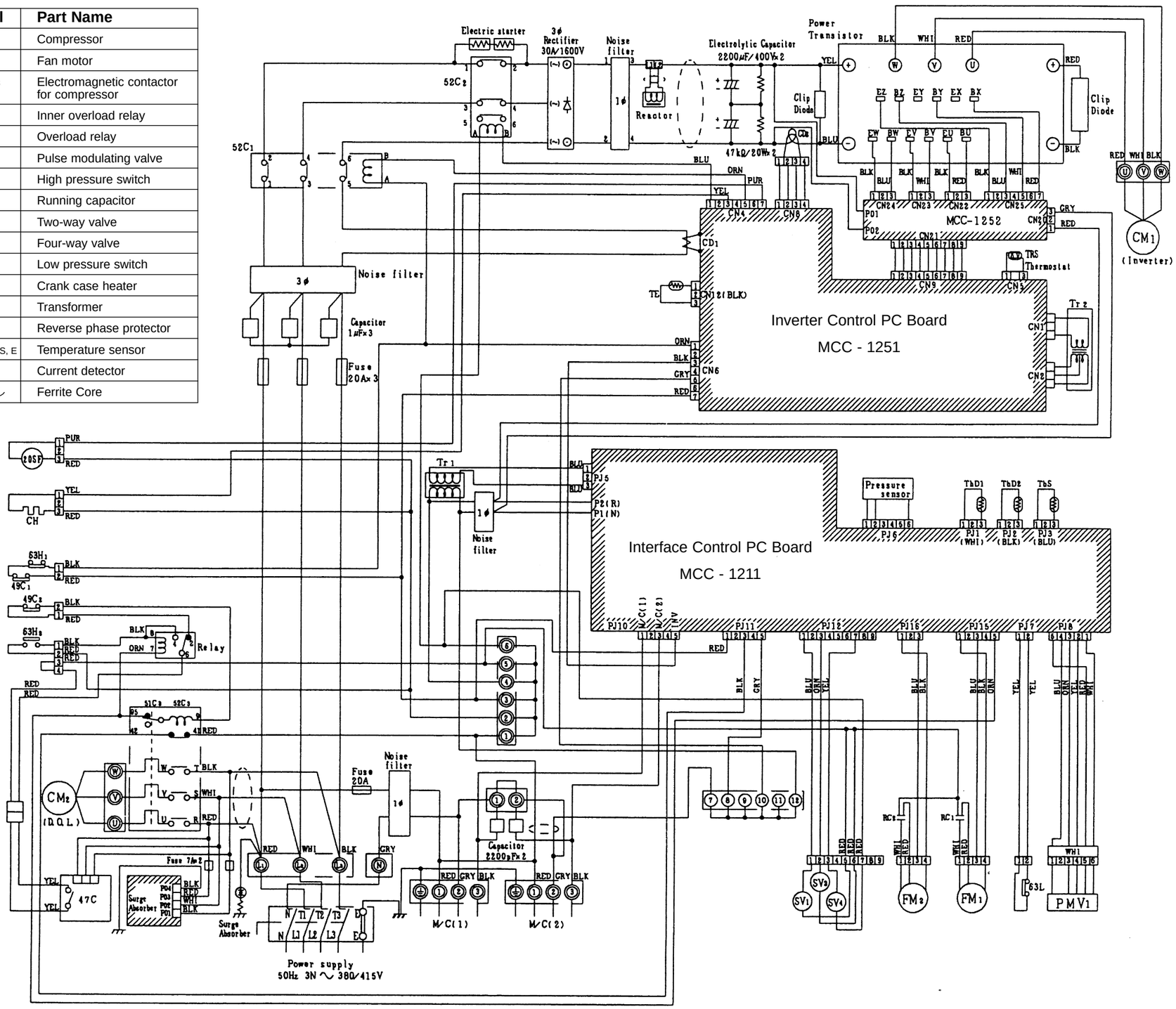
NEVER SHORT THE CAPACITOR TERMINALS WITH ANY METAL IMPLEMENT TO DISCHARGE. PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

Parts layout



5.2 2-Pipe Outdoor unit (MAR-M104HTM8-1-PE).

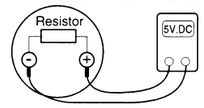
Symbol	Part Name
CM 1, 2	Compressor
FM 1, 2	Fan motor
52C 1, 2, 3	Electromagnetic contactor for compressor
49C 1, 2	Inner overload relay
51C 3	Overload relay
PMV 1	Pulse modulating valve
63H 1, 2	High pressure switch
RC 1, 2	Running capacitor
SV 1, 2, 4	Two-way valve
20SF	Four-way valve
63L	Low pressure switch
CH	Crank case heater
Tr 1, 2	Transformer
47C	Reverse phase protector
Th D1, D2, S, E	Temperature sensor
CD 1, 2	Current detector
	Ferrite Core



Notes :
1. The dashed lines indicate wiring on site.
2. ◎and □ indicate terminal blocks, and numbers within them are terminal numbers.
3. ▨ indicates a printed circuit board.

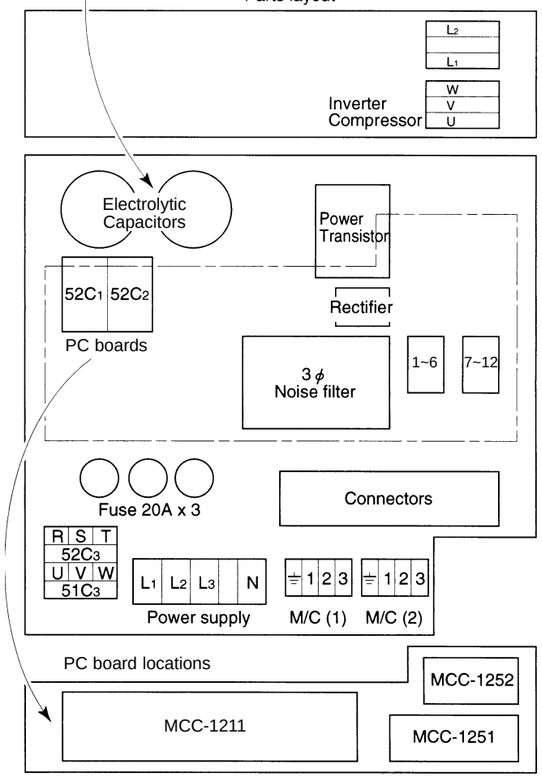
DANGER

THE ELECTROLYTIC CAPACITORS IN THIS PANEL ARE CHARGED TO 600 VOLTS D. C.
BEFORE SERVICING, TURN OFF THE POWER SUPPLY AND ALLOW AT LEAST 20 MINUTES FOR THE CAPACITORS TO DISCHARGE TO A SAFE LEVEL OF 5 VOLTS D. C. OR LESS. TEST WITH A D. C. VOLT METER AS SHOWN.



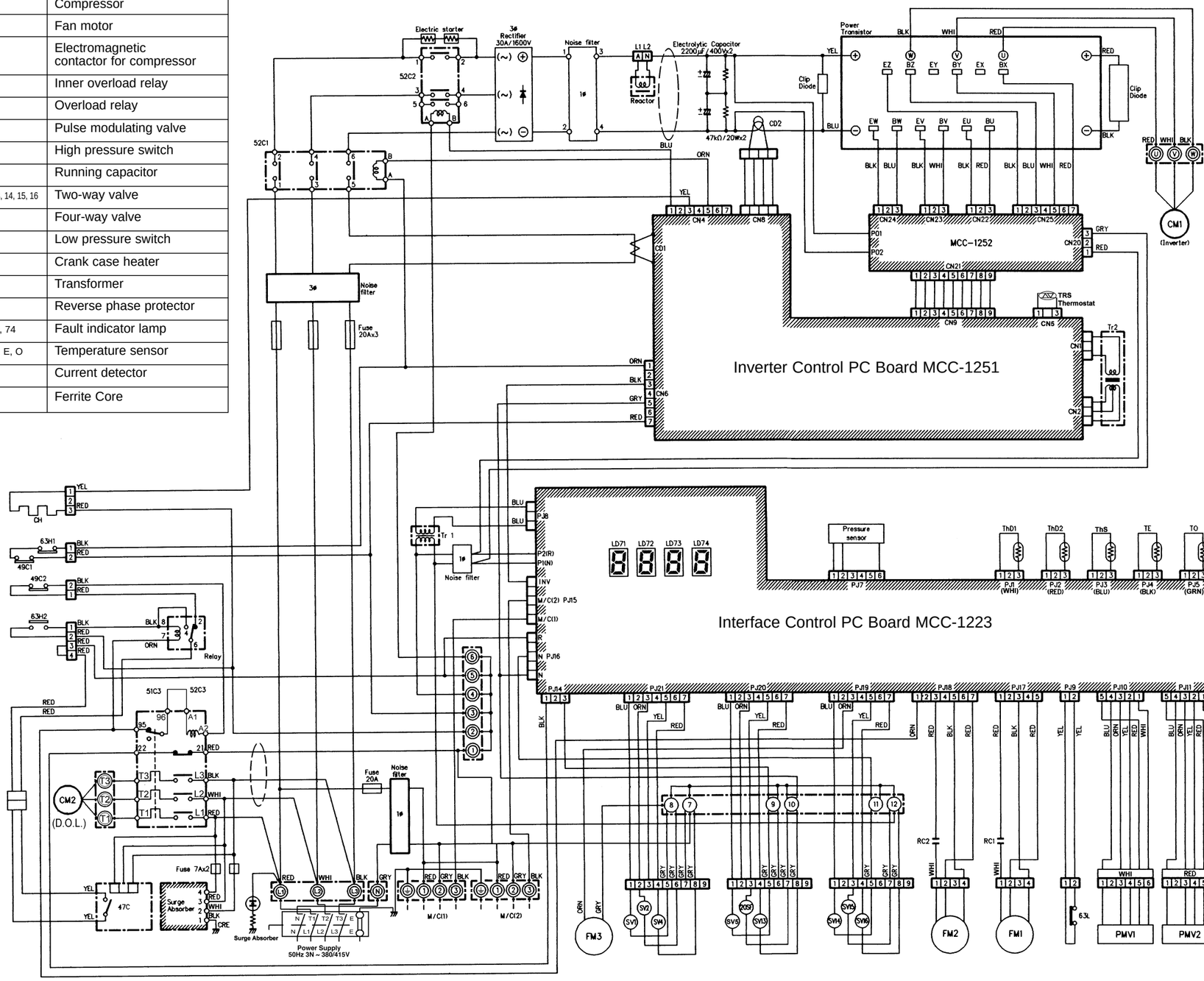
NEVER SHORT THE CAPACITOR TERMINALS WITH ANY METAL IMPLEMENT TO DISCHARGE. PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

Parts layout



5.3 3-Pipe Outdoor unit (MAR-F104HTM8-1-PE).

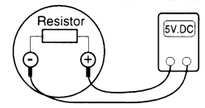
Symbol	Part Name
CM 1, 2	Compressor
FM 1, 2	Fan motor
52C 1, 2, 3	Electromagnetic contactor for compressor
49C 1, 2	Inner overload relay
51C 3	Overload relay
PMV 1	Pulse modulating valve
63H 1, 2	High pressure switch
RC 1, 2	Running capacitor
SV 1, 2, 4, 5, 13, 14, 15, 16	Two-way valve
20SF	Four-way valve
63L	Low pressure switch
CH	Crank case heater
Tr 1, 2	Transformer
47C	Reverse phase protector
LD 71, 72, 73, 74	Fault indicator lamp
Th D1, D2, S, E, O	Temperature sensor
CD 1, 2	Current detector
	Ferrite Core



Notes :
1. The dashed lines indicate wiring on site.
2. ◎ and □ indicate terminal blocks, and numbers within them are terminal numbers.
3. ▨ indicates a printed circuit board.

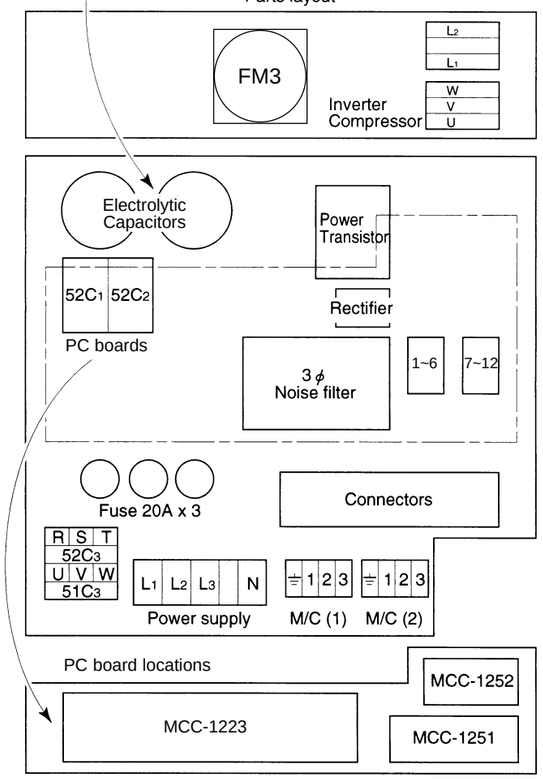
DANGER

THE ELECTROLYTIC CAPACITORS IN THIS PANEL ARE CHARGED TO 600 VOLTS D. C.
BEFORE SERVICING, TURN OFF THE POWER SUPPLY AND ALLOW AT LEAST 20 MINUTES FOR THE CAPACITORS TO DISCHARGE TO A SAFE LEVEL OF 5 VOLTS D. C. OR LESS. TEST WITH A D. C. VOLT METER AS SHOWN.

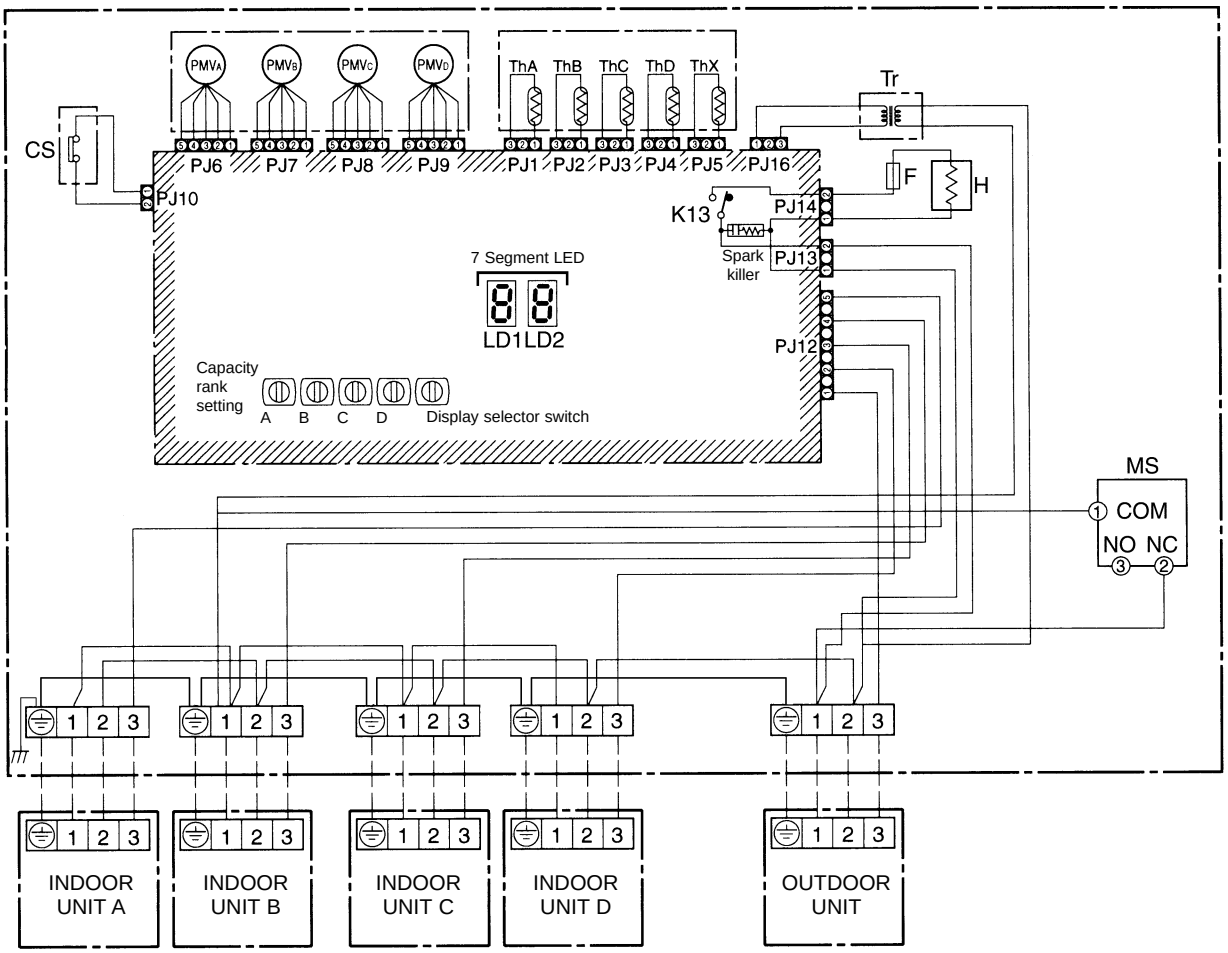


NEVER SHORT THE CAPACITOR TERMINALS WITH ANY METAL IMPLEMENT TO DISCHARGE. PERSONAL INJURY OR EQUIPMENT DAMAGE MAY RESULT.

Parts layout



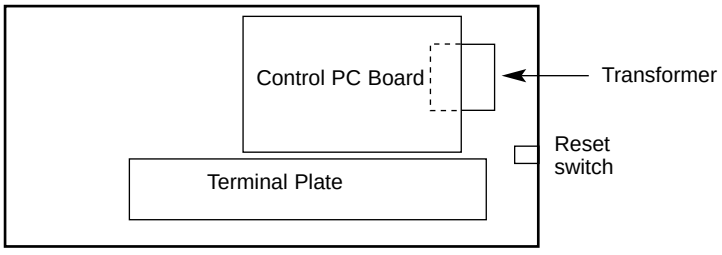
5.4 2-Pipe Multi Controller (RBM-Y1034C-PE, RBM-Y1044C-PE, RBM-Y1034-1-PE, RBM-Y1044-1-PE).



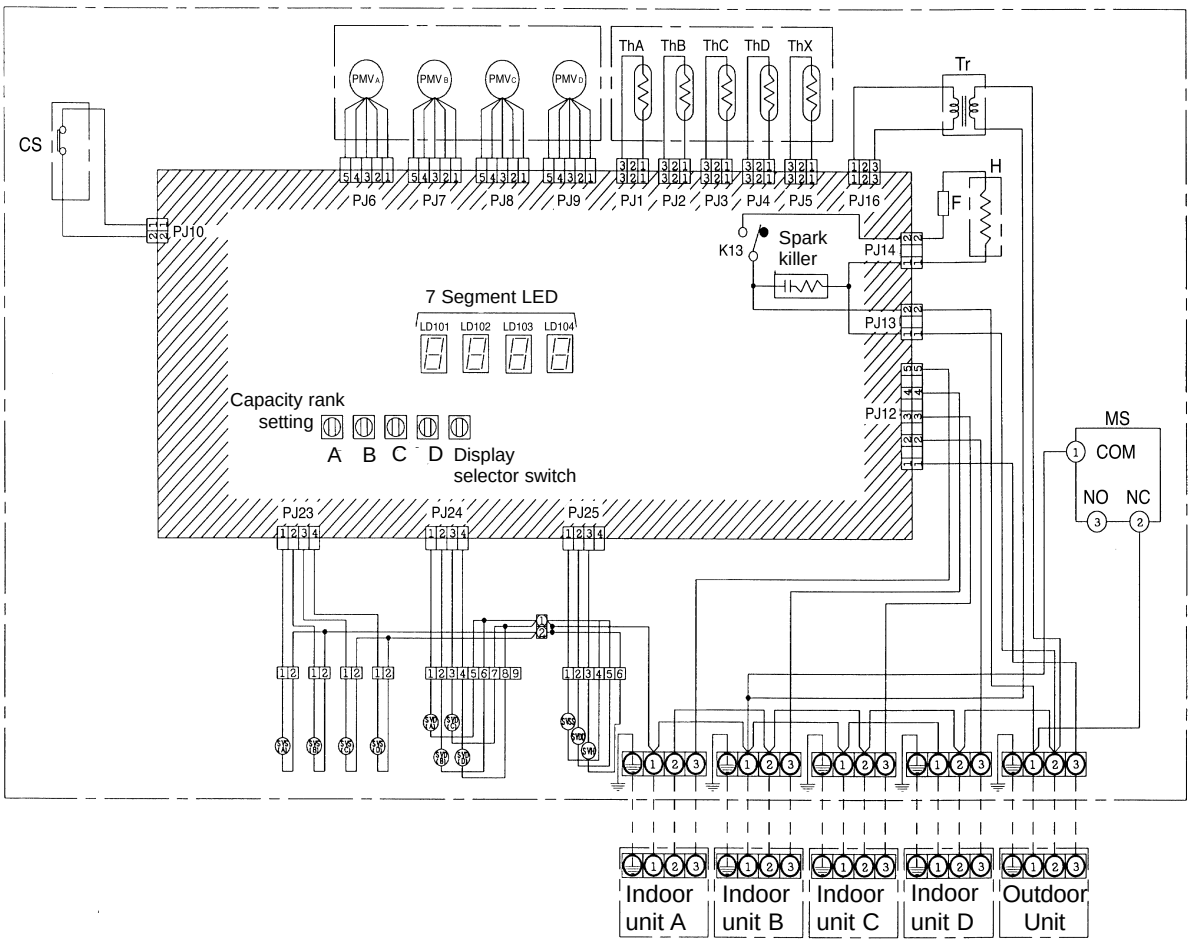
Symbol	Part Name
$PMV_{A, B, C, D}$	Pulse modulating valve
$Th_{A, B, C, D, X}$	Temperature sensor
Tr	Transformer
CS	Float switch
H	Heater
MS	Reset switch
LD1, LD2	Fault Indicator LED
F	Fuse (T1A)

- The dashed lines indicate wiring on site.
- ◯ and □ indicate terminal blocks, and numbers within them are terminal numbers.
- ▨ indicates a printed circuit board.
- The ┄ frame indicates the product body.
- RBM-Y1034C-PE and RBM-Y1034-1-PE do not have PMVD, ThD or the connection block for Indoor unit D. The capacity rank code setting for unit D is to be set to "0".

Parts layout

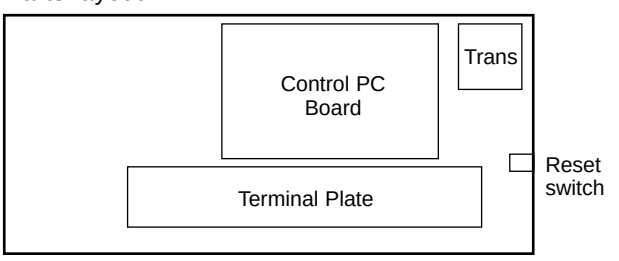


5.5 3-Pipe Multi Controller (RBM-Y1034F-PE, RBM-Y1044F-PE).



Symbol	Part Name
PMV A, B, C, D	Pulse modulating valve
Th A, B, C, D, X	Temperature sensor
Tr	Power transformer
CS	Float switch
H	Heater
MS	Reset switch
F	Fuse (T1A)
SVD (A), (B), (C), (D)	Electrically operated valve for discharge gas side
SVS (A), (B), (C), (D)	Electrically operated valve for suction gas side
SVDD	Electrically operated valve for increasing pressure
SVSS	Electrically operated valve for decreasing pressure
SVH	Electrically operated valve for superheat control
LD 101, 102, 103, 104	Fault indicator LED

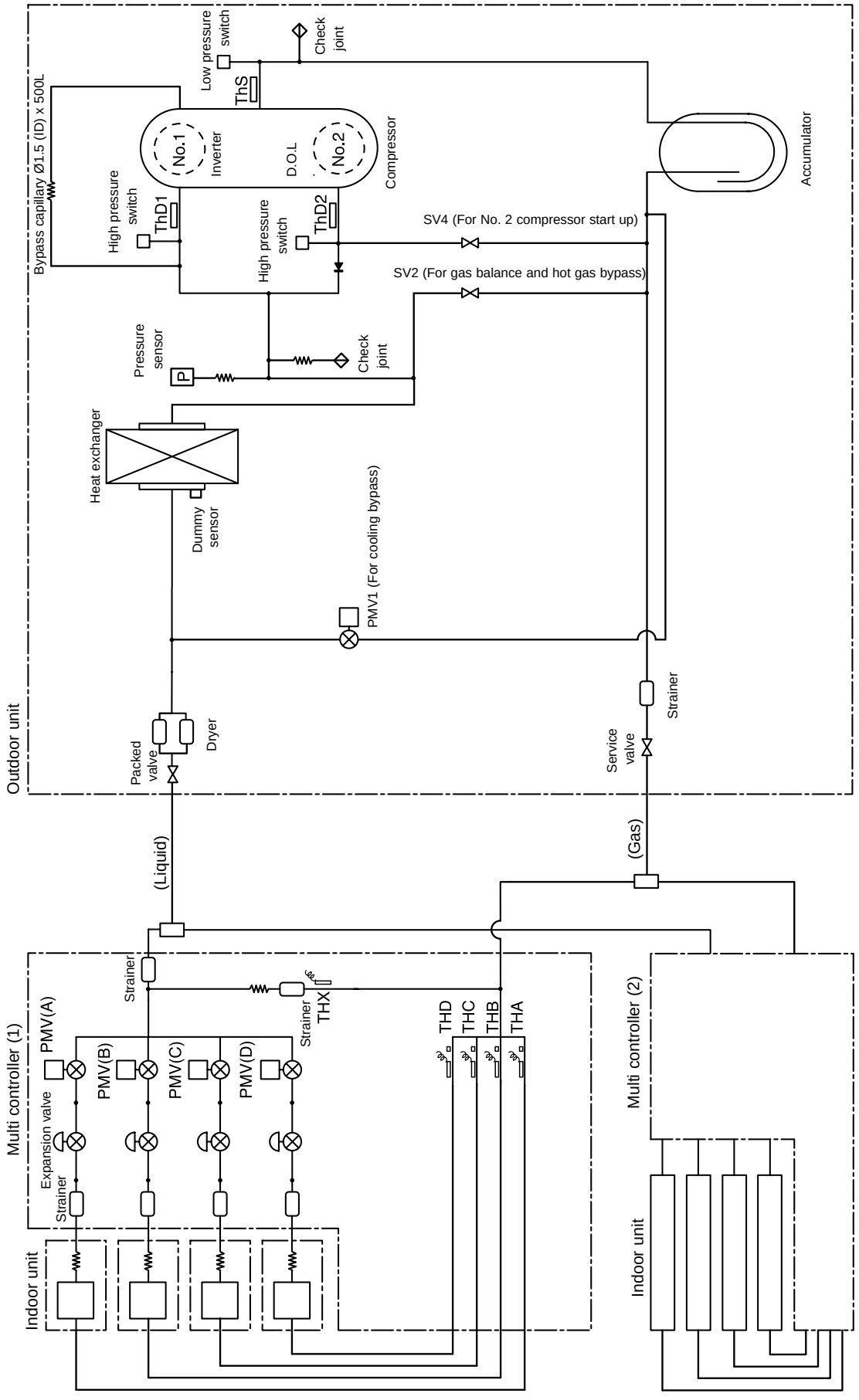
Parts layout



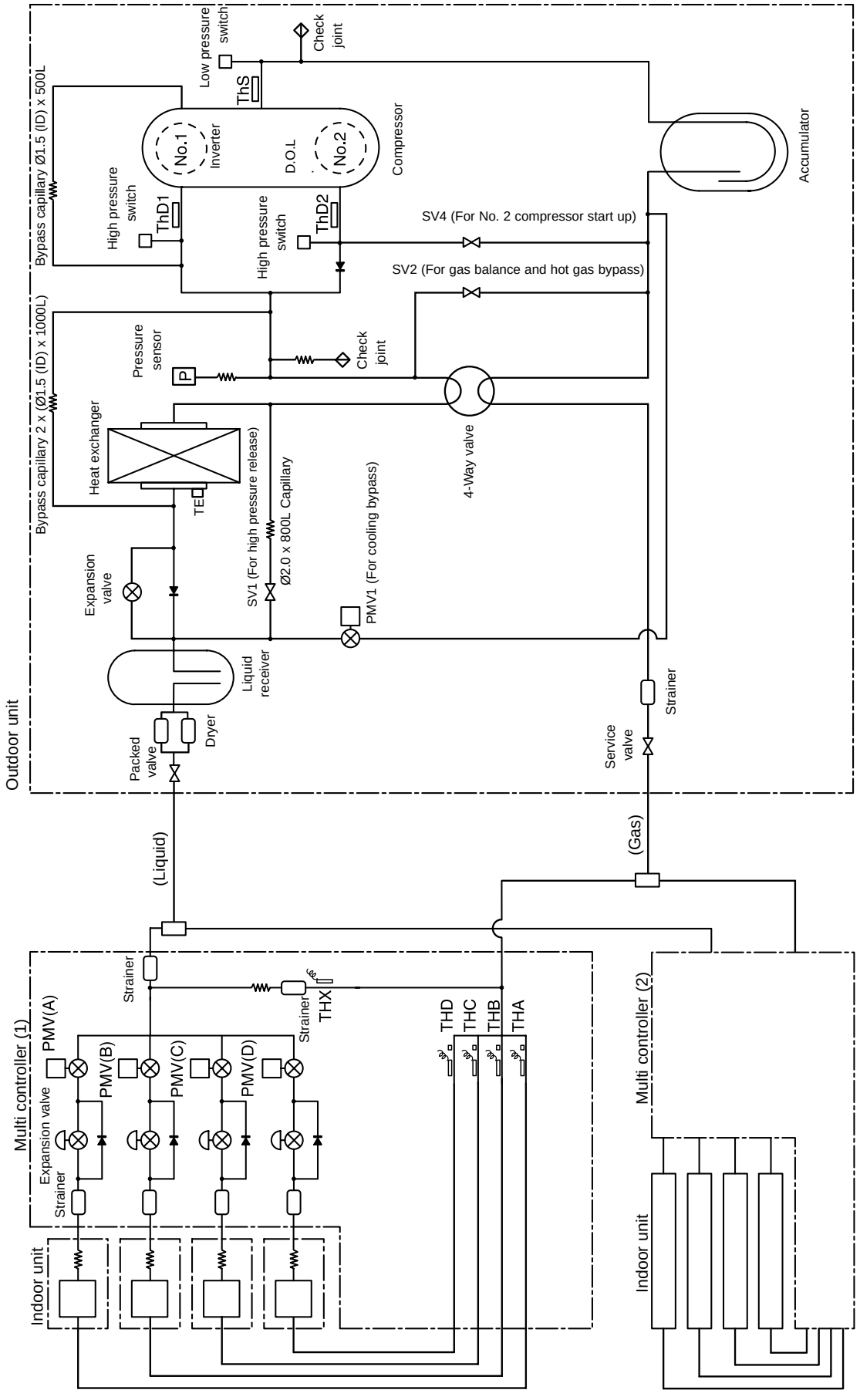
- The dashed lines indicate wiring on site.
- ◯ and □ indicate terminal blocks, and numbers within them are terminal numbers.
- ▨ indicates a printed circuit board.
- The ⬚ frame indicates the product body.
- RBM-Y1034F-PE does not have PMVD, SVD(D), SVS(D) ThD, or the connection block for Indoor unit D.
  The capacity rank code setting for unit D is to be set to "0".

6. REFRIGERANT CYCLE DIAGRAMS

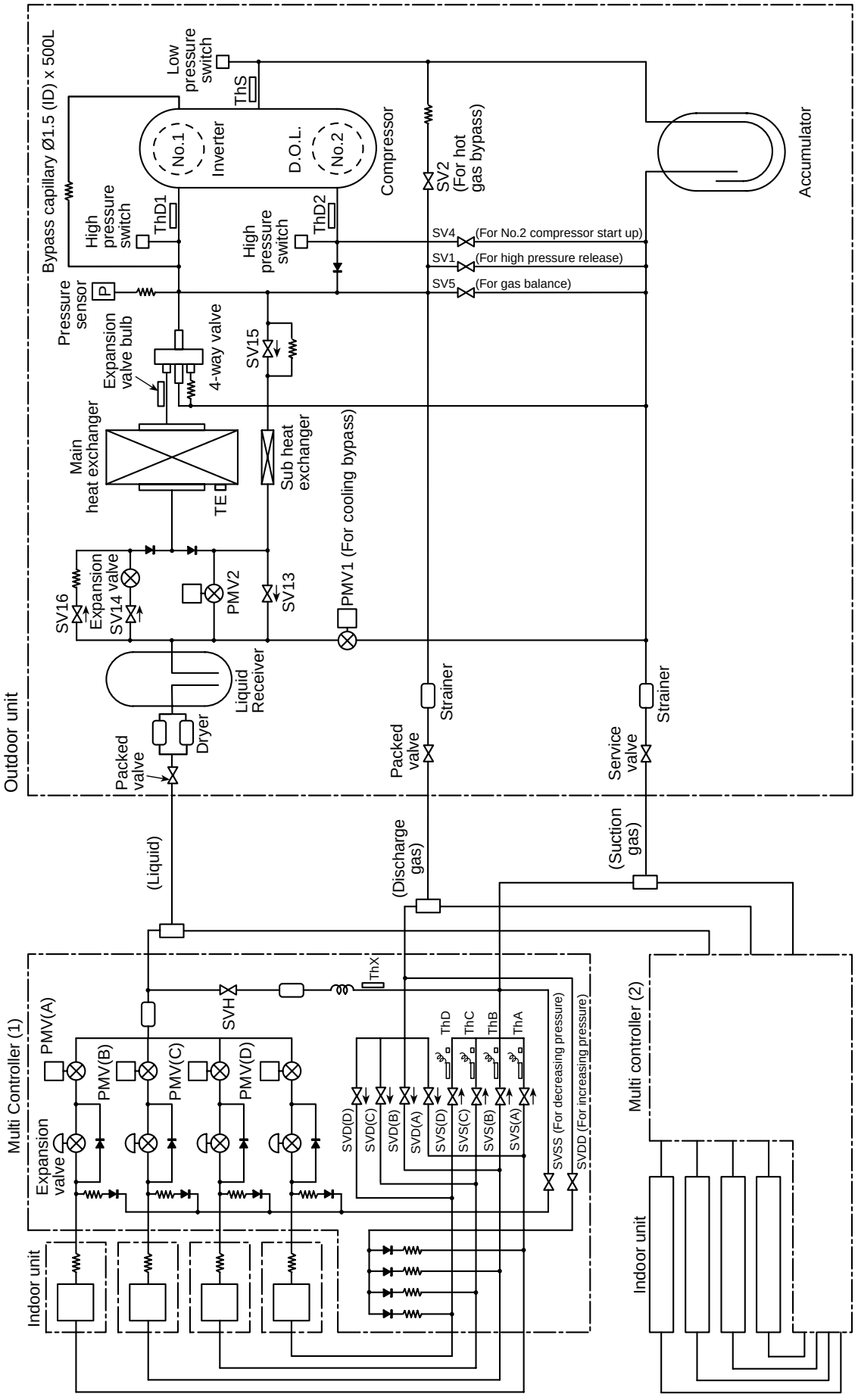
6.1 2-Pipe system (MAR-C104M8-1-PE).



6.2 2-Pipe system (MAR-M104HTM8-1-PE).



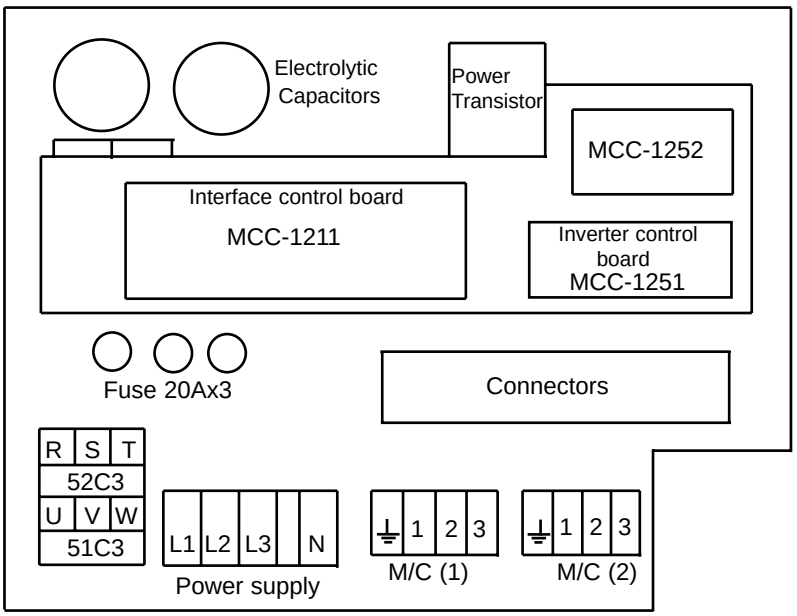
6.3 3-Pipe system (MAR-F104HTM8-1-PE).



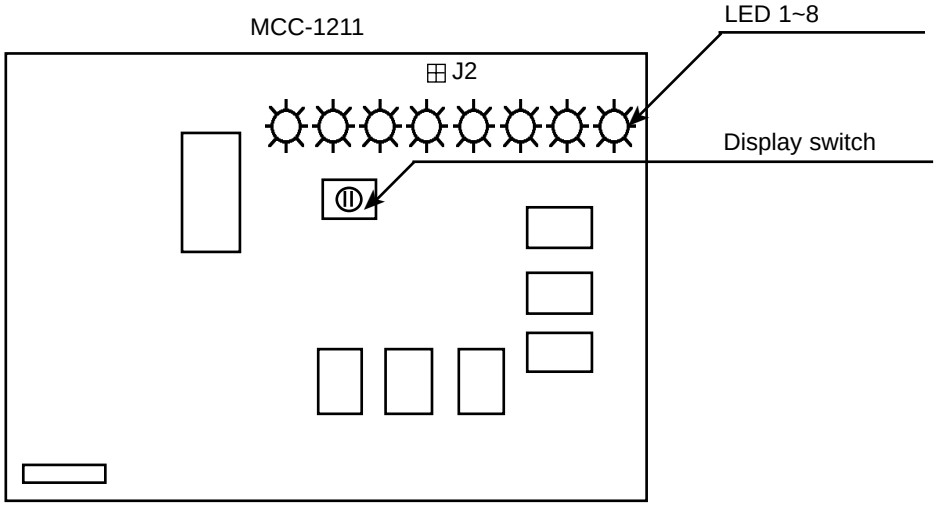
7. SELF DIAGNOSTIC DISPLAY INFORMATION

7.1 MAR-C104M8-1-PE, MAR-M104HTM8-1-PE, 2-Pipe Outdoor Unit.

Malfunction judgement is performed using the self-diagnostic function of the outdoor unit. The combination of the display switch and the 8 LED's (LED 1 ~ LED 8) indicate the diagnostic details.



Electrical parts location



Interface control board

7.1.1 Display switch information.

Switch position	Malfunction information
0	System Communication
1	Status of Compressors
2	System Status
3	Fault Diagnostics (Outdoor Units)
4	M/C 1 Units A & B Indoor Capacity Codes
5	M/C 1 Units C & D Indoor Capacity Codes
6	M/C 2 Units A & B Indoor Capacity Codes
7	M/C 2 Units C & D Indoor Capacity Codes
8	Fault Diagnostics (Multi Controller)
9	Circuit Test
10 ~ 15	Not used

7.1.2 Display switch set to position "0".

LED 1	On: Receiving serial signal from multi controller 1
LED 2	On: Sending serial signal to multi controller 1
LED 3	On: Receiving serial signal from multi controller 2
LED 4	On: Sending serial signal to multi controller 2
LED 5	On: Receiving serial signal from inverter control board
LED 6	On: Sending serial signal to inverter control board
LED 7	————
LED 8	————

7.1.3 Display switch set to position "1".

	LED 1	LED 2	LED 3	LED 4	Inverter frequency	
O: LED on X: LED off	X	X	X	X	0Hz	S0
	X	X	O	O	30Hz	S3
	X	O	X	X	36Hz	S4
	X	O	X	O	42Hz	S5
	X	O	O	X	46Hz	S6
	X	O	O	O	53Hz	S7
	O	X	X	X	61Hz	S8
	O	X	X	O	69Hz	S9
	O	X	O	X	76Hz	SA
	O	X	O	O	84Hz	SB
	O	O	X	X	92Hz	SC
	O	O	X	O	103Hz	SD
	O	O	O	X	111Hz	SE
	O	O	O	O	122Hz	SF
LED 5 LED 6	D.O.L. compressor			LED's on : Run / LED's off : Stop		
LED 7 LED 8	Frequency control			LED's on: Frequency control due to protection circuit		

7.1.4 Display switch set to position "2".

LED 1	Operating mode	LED on: Heating (MAR-M104HTM8-1-PE only) LED off: Cooling
LED 2	Defrost operation	LED on: Defrost (MAR-M104HTM8-1-PE only)
LED 3	————	————
LED 4	PMV status	LED on: Opening LED off: Closing
LED 5	Return signal	LED on: Return signal not receiving from INV
LED 6	————	
LED 7	Inverter abnormality	
LED 8	D.O.L. Compressor abnormality	

7.1.5 Display switch set to position "3".

LED 1	ThD1 sensor abnormality	LED on: Sensor open / short circuit
LED 2	ThD2 sensor abnormality	
LED 3	ThS sensor abnormality	
LED 4	High pressure abnormality	LED on: High pressure abnormal (detected by pressure sensor)
LED 5	Pressure sensor abnormality	LED on: Pressure sensor abnormal
LED 6	Discharge temperature abnormality	LED on: Discharge temperature abnormal (detected by ThD1or ThD2 sensor)
LED 7	Suction temperature abnormality	LED on: Suction temperature abnormal (detected by ThS sensor)
LED 8	Low pressure, gas leakage abnormality	LED on: Low pressure switch functioning

7.1.6 Display switch set to position "4", "5", "6" or "7".

	LED 1	LED 2	LED 3	LED 4	LED 5	LED 6	LED 7	LED 8
Sw4	Capacity rank of indoor unit connected to M/C (1) - Unit A				Capacity rank of indoor unit connected to M/C (1) - Unit B			
Sw5	Capacity rank of indoor unit connected to M/C (1) - Unit C				Capacity rank of indoor unit connected to M/C (1) - Unit D			
Sw6	Capacity rank of indoor unit connected to M/C (2) - Unit A				Capacity rank of indoor unit connected to M/C (2) - Unit B			
Sw7	Capacity rank of indoor unit connected to M/C (2) - Unit C				Capacity rank of indoor unit connected to M/C (2) - Unit D			

O: LED on		X: LED off		Indoor unit model capacity rank	Code No.
X	X	O	X	10	2
X	X	O	O	13	3
X	O	X	X	16	4
X	O	X	O	20	5
X	O	O	X	26	6
X	O	O	O	–	–
O	X	X	X	36	8
O	X	O	X	46	10

(Indoor unit model example: Model RAV-<u>364</u>UH-PE, Capacity rank = 36)

7.1.7 Display switch set to position "8".

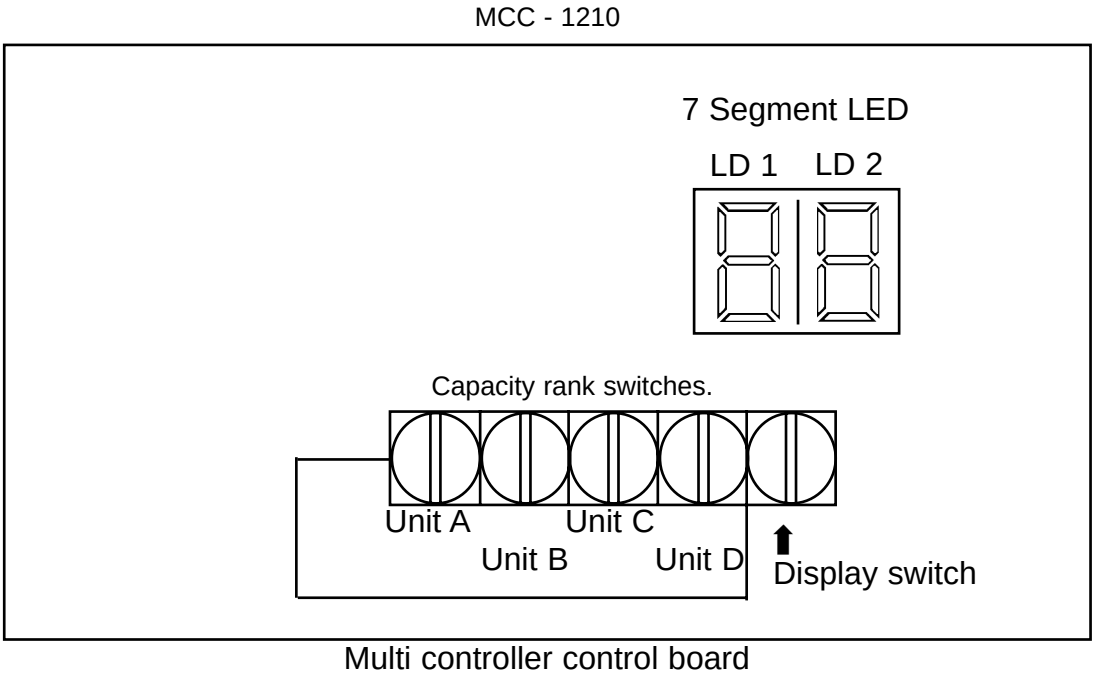
LED 1	Th(A) sensor abnormality	LED on: sensor open / short circuit.
LED 2	Th(B) sensor abnormality	
LED 3	Th(C) sensor abnormality	
LED 4	Th(D) sensor abnormality	
LED 5	Th(X) sensor abnormality	
LED 6	Over-capacity Light on when the total capacity of the indoor units exceeds 1.35 times the outdoor unit capacity.	
LED 7	M/C (1) fault. LED on : Abnormal	
LED 8	M/C (2) fault. LED on : Abnormal	

7.1.8 Display switch on set to position "9".

LED 1	M/C (1)	Unit A	When a LED is ON it indicates that there is a wiring or piping fault between the multi controller and the relevant indoor unit. (Refer to circuit connection test procedure).
LED 2		Unit B	
LED 3		Unit C	
LED 4		Unit D	
LED 5	M/C (2)	Unit A	
LED 6		Unit B	
LED 7		Unit C	
LED 8		Unit D	

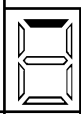
7.2 RBM-Y1034C-PE / RBM-Y1044C-PE, RBM-Y1034-1-PE / RBM-Y1044-1-PE, 2-Pipe Multi Controller.

The combination of the display switch and the two 7 segment LED's (LD1, LD2) indicate the diagnostic details.



7.2.1 Display switch information.

Switch position	Malfunction information
0	System Communication
1	Fault Codes
2	Level of Demand
3	Oil retrieval, Superheat control, Defrost
4	Operating Mode
5	Restart Timer
6	Circuit Test
7	PMV (A) Position
8	PMV (B) Position
9	PMV (C) Position
10	PMV (D) Position
11	ThA Sensor Data
12	ThB Sensor Data
13	ThC Sensor Data
14	ThD Sensor Data
15	ThX Sensor Data

Switch Position	Indication	7 Segment LED display.														
		LD 1							LD 2							
																
0	Serial signal	---	Receiving from unit B	Sending to unit B	---	Sending to unit A	Receiving from unit A	Receiving from Outdoor Unit	---	Receiving from unit D	Sending to unit D	---	Sending to unit C	Receiving from unit C	Sending to Outdoor Unit	
1	Fault Codes	Fault code display (Normal [00]) Refer to fault code section for details.														
2	Demand	Instructed demand frequency of Cooling or Heating [00 - 1F] Refer to table below.														
3	Oil retrieval, superheat control	---	Oil retrieval unit B	Superheat control unit B	---	Superheat control unit A	Oil retrieval unit A	---	---	Oil retrieval unit D	Superheat control unit D	---	Superheat control unit C	Oil retrieval unit C	---	
	Defrost	Displays [dF] during defrost operation														
4	Operation mode	Multi controller Heating [H]*, Cooling [C] Stop [0]							Outdoor unit Heating [H]*, Cooling [C] Other [0], Defrost [J]							
5	Restart timer	Normal display [00], Restart timer counting [01]														
6	Circuit test	Displays unit being tested [A b C d]							Indicates faulty unit connection [A b C d]							
7	PMV A	Displays the degree of PMV opening (0 - 240) as a Hexadecimal Code: [00] : Closed, [F0] : Fully Open														
8	PMV B															
9	PMV C															
10	PMV D															
11	ThA	Displays sensor temperature Refer to the sensor temperature conversion table (7.2.3).														
12	ThB															
13	ThC															
14	ThD															
15	ThX															

* Heating relates to MAR-M104HTM8-1-PE Outdoor Unit, RBM-Y1034-1-PE / RBM-Y1044-1-PE Multi Controller

7.2.2 Display switch set to position "2".

Displays the instructed demand frequency of heating or cooling from the multi-controller to the outdoor unit.

Display conversion table

Display code	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
Frequency conversion value (Hz)	0	0	0	3.9	6.9	10.0	13.1	16.2	19.3	22.4	25.5	28.6	31.7	34.8	37.9	41.0

Display code	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
Frequency conversion value (Hz)	44.1	47.2	50.3	58.4	56.5	59.6	62.7	65.8	68.9	72.0	75.1	78.2	81.3	84.4	87.5	90.0

7.2.3 Display switch set to position "11", "12", "13" and "14".

Multi controller – ThA, B, C, D and X sensor conversion table.

Display	Temperature (°C)
18	-10.0
1C	-9.0
20	-8.0
24	-7.0
28	-6.0
2C	-5.0
30	-4.0
34	-3.0
38	-2.0
3C	-1.0
40	0.0

Display	Temperature (°C)
44	1.0
48	2.0
4C	3.0
50	4.0
54	5.0
58	6.0
5C	7.0
60	8.0
64	9.0
68	10.0
6C	11.0

Display	Temperature (°C)
70	12.0
74	13.0
78	14.0
7C	15.0
80	16.0
84	17.0
88	18.0
8C	19.0
90	20.0
94	21.0
98	22.0

Display	Temperature (°C)
9C	23.0
A0	24.0
A4	25.0
A8	26.0
AC	27.0
B0	28.0
B4	29.0
B8	30.0

Display [00] signifies sensor open circuit.

7.2.4 Circuit connection test procedure.

The 2-Pipe system has a feature which enables it to check that the wiring and piping connections are aligned with each other. This is carried out by allowing refrigerant to flow to one Indoor unit at a time and monitor the Indoor units coil sensor for a corresponding drop in temperature. Each indoor unit is tested in turn and where two Multi controllers are installed each Multi controller is tested in turn.

This test would normally be used at the commissioning stage.

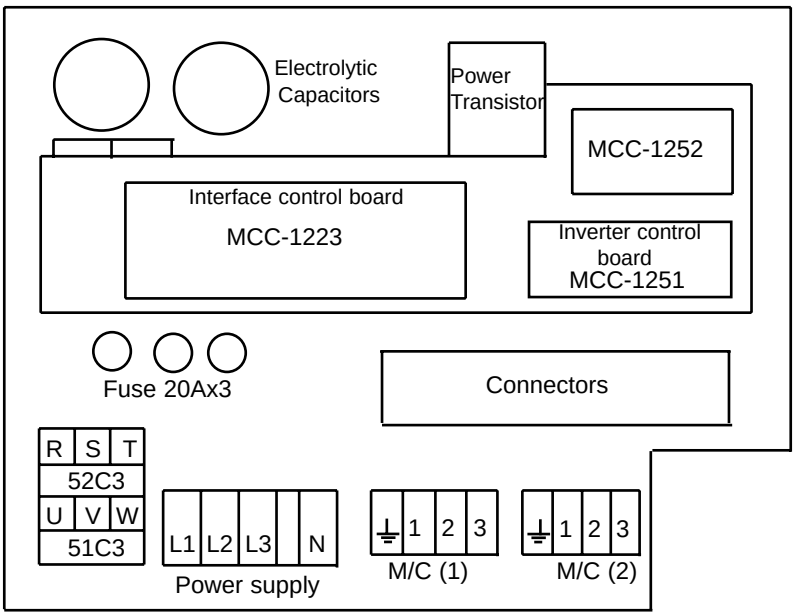
Procedure for initialising the circuit test.

1. Turn the power off.
2. Ensure capacity codes are set correctly, capacity switches set to "0" are not tested.
3. Put the Outdoor display switch to 9 and Multi controller(s) display switch to 6.
4. Turn the power back on.
5. Set all the Remote controllers to cool mode and 29°C.
6. Press the on / off button to start the indoor units.
7. Go to the Outdoor unit and press switch J2 (above 8xLED's) for 3 seconds.
8. The system is now in self-testing mode (all 8 LED's will be flashing rapidly).
9. The system will stop at the end of the test.

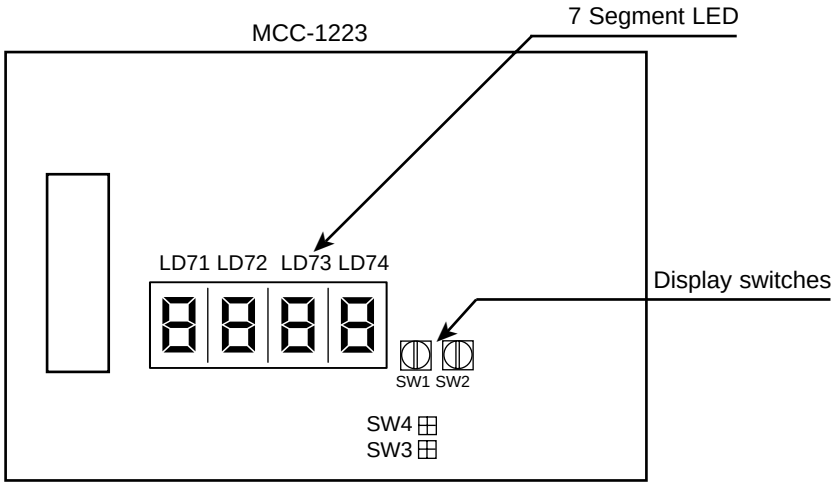
In the event of cross wiring / piping the system will indicate which units are faulty. Refer to self diagnostic information (7.1.8).

7.3 MAR-F104HTM8-1-PE, 3-Pipe Outdoor Unit.

Malfunction judgement is performed using the self-diagnostic function of the outdoor unit. The combination of the display switches (SW1, SW2) and the LED's (LD 71 ~ LD 74) indicate the diagnostic details.



Electrical parts location



Interface control board

7.3.1 Display switch SW1 set to position "0".

Communication serial signals and the system operating status are displayed by changing display switch SW2.

<table>
<tr><th rowspan="2">Display Switch SW2 Position</th><th colspan="2" rowspan="2">Indication</th><th colspan="4">7 Segment LED Display</th></tr>
<tr><th>LD71</th><th>LD72</th><th>LD73</th><th>LD74</th></tr>
<tr><td rowspan="3">0</td><td colspan="2" rowspan="3">Sending / receiving status of interface control board serial signal</td><td>Between M/C (1)</td><td>Between M/C (2)</td><td>Between Inverter</td><td>Non-inverter compressor</td></tr>
<tr><td>Sending only [S]</td><td>Not sending or receiving [ ]</td><td rowspan="2"></td><td>Abnormal [E]</td></tr>
<tr><td>Receiving only [J]</td><td>Sending and receiving [0]</td><td>Normal [0]</td></tr>
<tr><td>1</td><td rowspan="2">Operating instruction from M/C (1)</td><td>Operating mode</td><td colspan="2">Heating [H], Simultaneous cooling/heating [HC], Cooling [C], Stop [ ]</td><td>———</td><td>———</td></tr>
<tr><td>2</td><td>Instruction frequency</td><td colspan="2">Heating frequency [00-1F]
(Refer to conversion table)</td><td colspan="2">Cooling frequency [00-1F]
(Refer to conversion table)</td></tr>
<tr><td>3</td><td rowspan="2">Outdoor unit operating condition</td><td>Operating mode</td><td colspan="2">Heating [H], Cooling [0C], Simultaneous heating [Hc] Defrost [J0], Simultaneous cooling [hC]</td><td>———</td><td>———</td></tr>
<tr><td>4</td><td colspan="2">M/C operation Off: [0] 1 unit: [1] 2 unit: [2]</td><td>Frequency release No: [0] Yes: [1]</td><td>———</td><td>———</td></tr>
<tr><td>5</td><td rowspan="2">Operating instruction from M/C (2)</td><td>Operating mode</td><td colspan="2">Heating [H], Simultaneous cooling/heating [HC], Cooling [C], Stop [-]</td><td>———</td><td>———</td></tr>
<tr><td>6</td><td>Instruction frequency</td><td colspan="2">Heating frequency [00-1F]
(Refer to conversion table)</td><td colspan="2">Cooling frequency [00-1F]
(Refer to conversion table)</td></tr>
<tr><td rowspan="2">9</td><td colspan="2" rowspan="2">Inverter operation status</td><td>Normal [C]</td><td rowspan="2">Operating frequency [0-F], (Refer to table)</td><td rowspan="2">———</td><td rowspan="2">———</td></tr>
<tr><td>Abnormal [E]</td></tr>
<tr><td rowspan="2">10</td><td colspan="2" rowspan="2">Operating instruction to inverter from interface control board</td><td>Normal [C]</td><td rowspan="2">Instruction frequency [0-F] , (Refer to table)</td><td>———</td><td>———</td></tr>
<tr><td>Abnormal [E]</td><td>———</td><td>———</td></tr>
<tr><td>11</td><td colspan="2">Power supply frequency</td><td>50Hz [5]
60Hz [6]</td><td>[0]</td><td>———</td><td>———</td></tr>
</table>

Display code conversion table – Instruction frequency from Multi Controller.

Display code	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
Frequency conversion value (Hz)	0	0	0	3.9	6.9	10.0	13.0	16.2	19.3	22.4	25.5	28.6	31.7	34.8	37.9	41.0

Display code	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
Frequency conversion value (Hz)	44.1	47.2	50.3	53.4	56.5	59.6	62.7	65.8	68.9	72.0	75.1	78.2	81.3	84.4	87.5	90.0

Display code conversion table - Operating frequency of Inverter Compressor.

Display code	0	3	4	5	6	7	8	9	A	B	C	D	E	F
Frequency conversion value (Hz)	0	30.5	38.1	42.0	45.8	53.4	61.0	68.7	76.3	83.9	91.6	103.0	110.6	121.6

7.3.2 Display switch SW1 set to position "1".

PMV opening information is displayed.

Display switch SW2	Indication	7 Segment LED Display			
		LD71	LD72	LD73	LD74
2	PMV1 opening	[P]	[1]	Displays the degree of PMV opening (0 - 240) as a Hexadecimal Code: [00] : Closed, [F0] : Fully Open	
3	PMV2 opening	[P]	[2]		

7.3.3 Display switch SW1 set to position "2".

Malfunction information is displayed, refer to fault code section for details.

Display switch SW2	Indication	7 segment LED display			
		LD71	LD72	LD73	LD74
0	Check code display for the Outdoor unit, M/C (1), M/C (2)	[E]	Outdoor unit: [r] M/C (1): [1] M/C (2): [2]	Refer to fault code section for details.	

7.3.4 Display switch SW1 set to position "3".

The indoor unit capacity rank setting is displayed.

Display Switch SW2	Indication		7 Segment LED Display			
			LD71	LD72	LD73	LD74
0	Outdoor unit HP		[9]	8 HP [8], 10 HP [A]	[H]	[P]
1	Capacity rank of indoor unit connected to M/C (1)	Unit A	[A]	Displays the code number of the indoor unit registered to each M/C. Refer to the table below for indoor unit model capacity rank.		
2		Unit B	[b]			
3		Unit C	[C]			
4		Unit D	[d]			
5	Capacity rank of indoor unit connected to M/C (2)	Unit A	[A]			
6		Unit B	[b]			
7		Unit C	[C]			
8		Unit D	[d]			

Indoor unit code No. conversion table.

Code No.	0	2	3	4	6	8	10
Capacity rank	No Connection	10	13	16	26	36	46

(Indoor unit model example: Model RAV-364UH-PE, Capacity rank = 36)

7.3.5 Display switch SW1 set to position "4"

The sensor data is displayed.

Display Switch SW2	Indication	7 Segment LED Display			
		LD71	LD72	LD73	LD74
0	Pressure sensor data	[P]	[d]		
1	ThD1 sensor data	[d]	[1]	Displays sensors reading. Refer to the following conversion tables.	
2	ThD2 sensor data	[d]	[2]		
3	ThS sensor data	[S]	[1]		
4	TE sensor data	[h]	[E]		
5	TO sensor data	[h]	[0]		

7.3.6 Outdoor unit – Pressure sensor data.

Display	Pressure (kgf/cm²G)
17	0.0
1E	1.0
25	2.0
2D	3.0
34	4.0
3B	5.0
43	6.0
4A	7.0
51	8.0
58	9.0
5C	9.5
60	10.0
63	10.5

Display	Pressure (kgf/cm²G)
67	11.0
6B	11.5
6E	12.0
72	12.5
76	13.0
79	13.5
7D	14.0
81	14.5
84	15.0
88	15.5
8B	16.0
8F	16.5
93	17.0

Display	Pressure (kgf/cm²G)
96	17.5
9A	18.0
9E	18.5
A1	19.0
A5	19.5
A9	20.0
AC	20.5
BD	21.0
B4	21.5
B7	22.0
BB	22.5
BE	23.0
C2	23.5

Display	Pressure (kgf/cm²G)
C6	24.0
C9	24.5
CD	25.0
D1	25.5
D4	26.0
D8	26.5
DC	27.0
DF	27.5
E3	28.0
E7	28.5
EA	29.0
EE	29.5
F2	30.0

These are sample displays. Intermediate displays to those above are possible.

7.3.7 Outdoor unit – ThD1 and ThD2 sensor data.

Display	Tempera-ture (°C)
05	-5.0
07	0.0
09	5.0
0C	10.0
0F	15.0
12	20.0
17	25.0
1C	30.0
22	35.0

Display	Tempera-ture (°C)
28	40.0
30	45.0
38	50.0
41	55.0
4A	60.0
54	65.0
5E	70.0
68	75.0
72	80.0

Display	Tempera-ture (°C)
7C	85.0
87	90.0
90	95.0
9A	100.0
A2	105.0
AB	110.0
B2	115.0
B9	120.0
C0	125.0

Display	Tempera-ture (°C)
C6	130.0
CB	135.0
D0	140.0

These are sample displays. Intermediate displays to those above are possible.

Display [00] signifies sensor open circuit.

7.3.8 Outdoor unit – ThS, TE, TO sensor data.

Display	Temperature (°C)
2A	-20.0
36	-15.0
42	-10.0
51	-5.0
60	0.0
63	1.0
66	2.0
69	3.0
6C	4.0
6F	5.0
73	6.0
76	7.0
79	8.0

Display	Temperature (°C)
7C	9.0
7F	10.0
82	11.0
85	12.0
88	13.0
8B	14.0
8E	15.0
91	16.0
94	17.0
97	18.0
9A	19.0
9C	20.0
9F	21.0

Display	Temperature (°C)
A2	22.0
A5	23.0
A7	24.0
AA	25.0
AC	26.0
AF	27.0
B1	28.0
B3	29.0
B6	30.0
B8	31.0
BA	32.0
BC	33.0
BE	34.0

Display	Temperature (°C)
C0	35.0
C2	36.0
C4	37.0
C6	38.0
C8	39.0
C9	40.0
D1	45.0
D8	50.0
DE	55.0
E3	60.0
E7	65.0
EA	70.0

These are sample displays. Intermediate displays to those above are possible.

Display [00] signifies sensor open circuit.

7.3.9 Circuit connection test procedure.

The 3-Pipe system has a feature which enables it to check that the wiring and piping connections are aligned with each other. This is carried out by allowing refrigerant to flow to one indoor unit at a time and monitor the Indoor units coil sensor for a corresponding drop in temperature. Each Indoor unit is tested in turn and where two Multi controllers are installed each Multi controller is tested in turn.

This test would normally be used at the commissioning stage.

Procedure for intialising the circuit test:

1. Turn the power off.
2. Ensure capacity codes are set correctly, capacity switches set to "0" are not tested.
3. Set the Outdoor display switches SW1 and SW2 to 9 and Multi controller(s) display switch to 6.
4. Turn the power back on.
5. Set all the Remote controllers to cool mode and 29°C.
6. Press the on / off button to start the Indoor units. The Outdoor LED's show "1020".
7. Press the Outdoor unit switch SW3 for 3 seconds.
8. The system is now in self-testing mode (LED's will be flashing).
9. The system will stop at the end of the test.

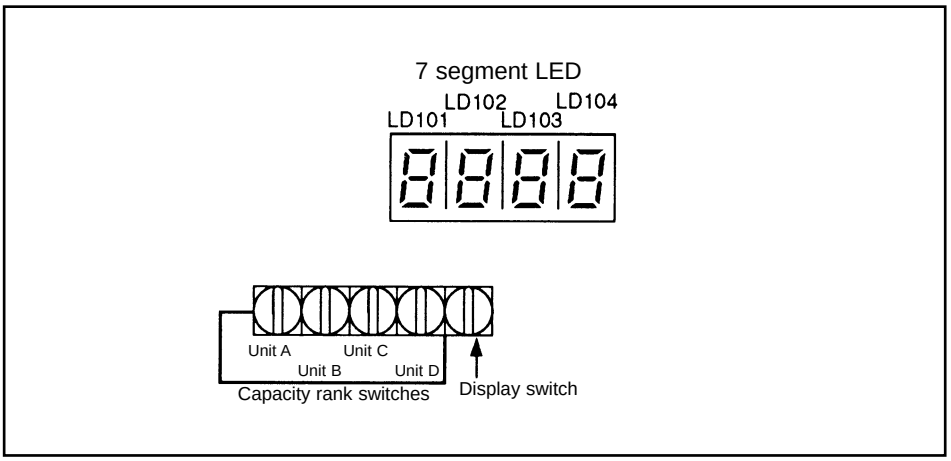
In the event of cross wiring / piping the system will indicate which units are faulty, as shown by the LED's. Refer to the table below.

M/C 1			M/C 2		
1	A B C D	Units indicated failed the test.	2	A B C D	Units indicated failed the test.
	0	No faults		0	No faults

7.4 RBM-Y1034F-PE, RBM-Y1044F-PE, 3-Pipe Multi Controller.

The combination of the display switch and the four 7 segment LED's (LD101 - LD104) indicate the diagnostic details.

MCC - 1223



Multi controller control board

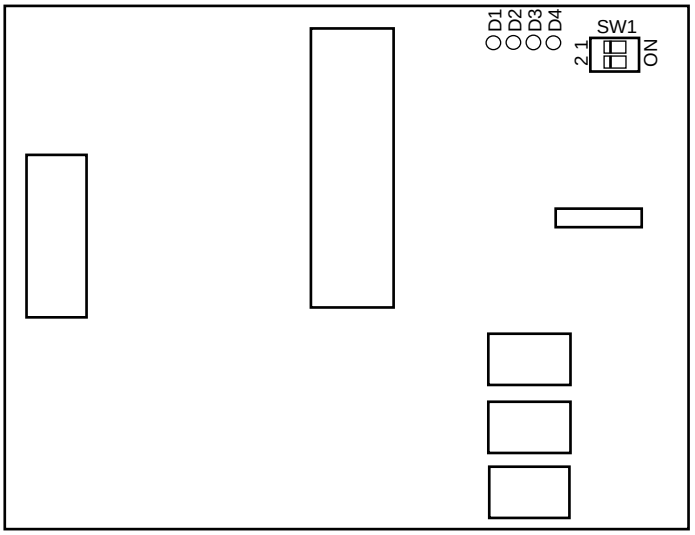
Switch Position	Indication	7 Segment LED Display														
		LD101	LD102	LD103							LD104					
				8	8	8	8	8	8	8	8	8	8	8	8	8
0	Serial signal	---	---	---	Receiving from unit B	Sending to unit B	---	Sending to unit A	Receiving from unit A	Receiving from outdoor unit	---	Receiving from unit D	Sending to unit D	---	Sending to unit C	Receiving from unit C	Sending to outdoor unit
1	Fault codes	[E]	---	Fault code display (Normal [00]) Refer to fault code section for details.												
2	Frequency instructions to the outdoor unit.	Instructed demand frequency of Cooling or Heating [00 - 1F] Refer to the 2-Pipe Multi controller display conversion table for display switch position "2".														
3	Oil retrieval, Superheat control	---	---	---	Oil retrieval unit B	Superheat control unit B	---	Superheat control unit A	Oil retrieval unit A	---	---	Oil retrieval unit D	Superheat control unit D	---	Superheat control unit C	Oil retrieval unit C	---
	Defrost			Displays [dF] during defrost operation												
4	Operation mode	M/C operating mode: Heating [H-] Cooling: [C-]*		Outdoor unit operating mode:Heating [H-], Cooling [-C], Simultaneous Heating [Hc], Simultaneous Cooling [hC], Stop [--], Defrost [J-]												
5	Restart timer	---	---	---							Normal display [0], Restart timer counting [1]					
6	Circuit test	[c]	[k]	Displays unit being tested [A b C d]							Indicates faulty unit connection [A b C d]					
7	PMV A	[P]	[A]	Displays the degree of PMV opening (0 - 240) as a Hexadecimal Code: [00] : Closed, [F0] : Fully Open												
8	PMV B	[P]	[b]													
9	PMV C	[P]	[c]													
10	PMV D	[P]	[d]													
11	ThA	[h]	[A]	Displays sensor temperature Refer to the 2-Pipe Multi controller sensor temperature conversion table (7.2.3).												
12	ThB	[h]	[b]													
13	ThC	[h]	[c]													
14	ThD	[h]	[d]													
15	ThX	[h]	[H]													

* and Simultaneous Cooling/Heating [HC], Defrost [J-].

7.5 Inverter control board, 2-Pipe and 3-Pipe Outdoor Units.

The combination of the dip switch SW1 and the four LED's (D1 ~ D4) indicate the inverter compressor speed and diagnostic details.

MCC - 1251



Inverter control board

SW1 position		Display information
1	2	
ON	ON	Inverter compressor demand frequency
OFF	ON	Inverter compressor actual frequency
OFF	OFF	Fault code indication
ON	OFF	Fault indication sequence

7.5.1 Inverter compressor speed indication

LED Binary display	Inverter compressor freq.	
X X X X	OFF	0 Hz
X X O O	3	30.5 Hz
X O X X	4	38.1 Hz
X O X O	5	42.0 Hz
X O O X	6	45.8 Hz
X O O O	7	53.4 Hz
O X X X	8	61.0 Hz
O X X O	9	68.7 Hz
O X O X	A	76.3 Hz
O X O O	B	83.9 Hz
O O X X	C	91.6 Hz
O O X O	D	103.0 Hz
O O O X	E	110.6 Hz
O O O O	F	121.6 Hz

Cooling operation maximum frequency.

Heating operation maximum frequency } for models MAR-M104HTM8-1-PE / MAR-F104HTM8-1-PE only

7.5.2 Inverter fault code indication.

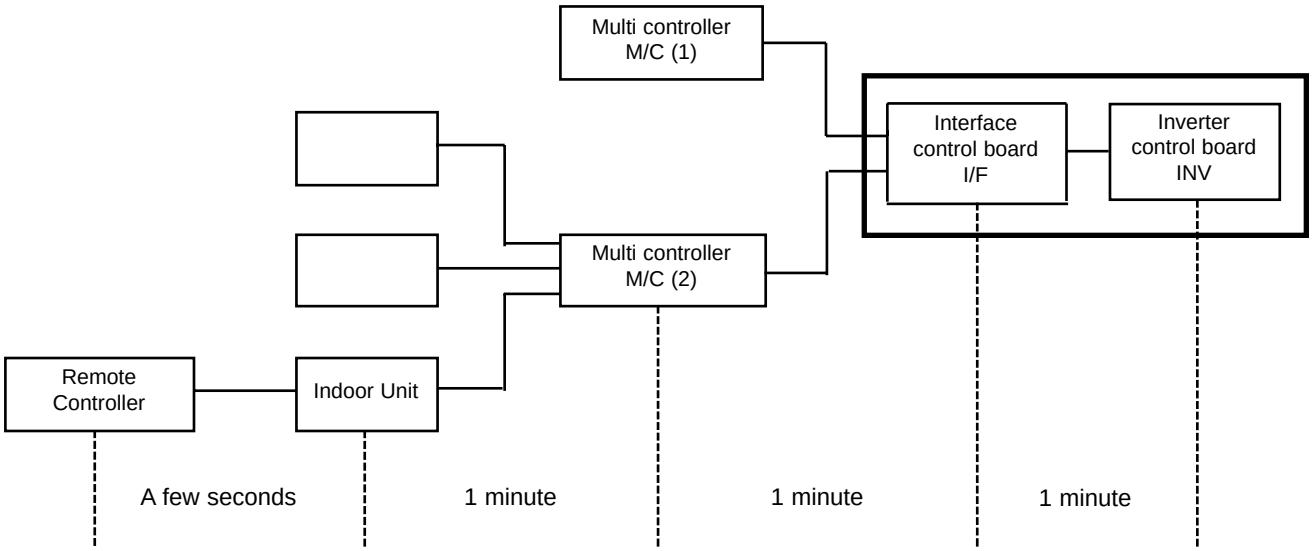
LED Display	Fault indicated	Remote controller fault code
O O O ¤	Inverter high pressure or compressor winding temperature	21
¤ O O O	Inverter compressor winding short circuit protection	14
O O O O	TE sensor open / short circuit (2-Pipe only)	18
O ¤ O O	Inverter compressor overload protection	1d
O O ¤ O	Inverter circuit / compressor failure	1F

7.5.3 Inverter fault indication sequence.

LED Display	Fault indicated
X X X O	First failure
X X O X	Second failure
X X O O	Third failure
¤ O ¤ ¤	System locked out

X LED off
O LED on
¤ LED flashing

7.6 Control board communication diagram.



Remote controller fault code display time lapse for system malfunctions.

Serial signal abnormalities:	Between the I/F and the INV	More than 3 minutes.
	Between the M/C and the I/F	More than 2 minutes.
	Between the indoor unit and the M/C	More than 1 minute.
	Between the remote controller and indoor unit	A few seconds.
INV abnormality:		More than 3 minutes.
I/F abnormality:		More than 2 minutes.
M/C and Indoor unit abnormality:		More than 1 minute.

8. FAULT CODE DISPLAY INFORMATION

The remote controller, multi controller and outdoor unit have the facility to display fault codes which are used to determine any malfunction of the system.

- The remote controller is provided with a "check" button and a check display.
- The multi controllers and outdoor units are provided with display switches and LED displays.

Initially malfunctions can be identified from the remote controller check display.

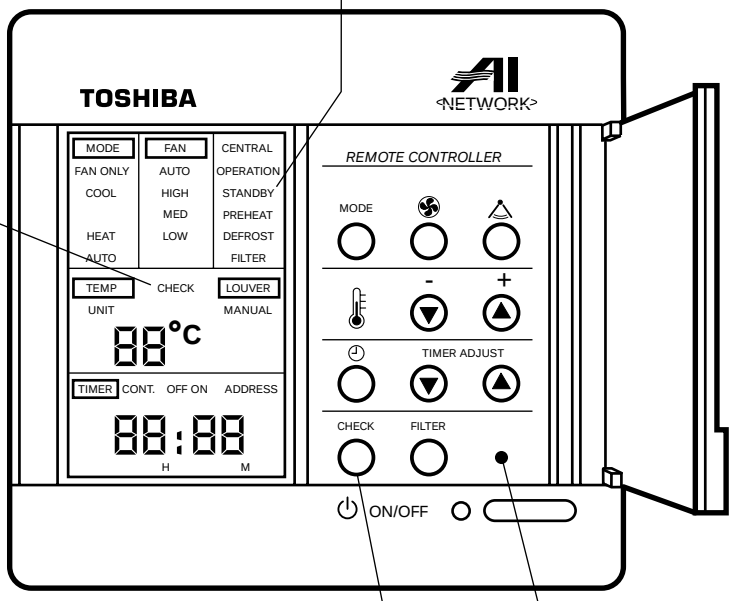
Details of the multi controller and outdoor unit malfunctions can be determined from their control boards. (Multi controller malfunctions are also displayed on the outdoor unit interface control board).

8.1 Fault code identification.

When a malfunction has been identified, do not reset the system. Press the "CHECK" button on the remote controller and observe the display.

The location and cause of the malfunction can be determined from the fault code.

"STANDBY" displayed
- The total capacity rank settings of indoor units connected exceeds the allowable level, or an indoor capacity rank is set at "0" (Multi controller).
- For the 2-Pipe MAR-M104HTM8-1-PE heating operation has priority over cooling.
  In the event of an indoor unit requesting cooling operation when another is in heating mode.
  "STANDBY" will be displayed.



"CHECK"

Flashes when phases are rotated.

Reset button
- Pressing the reset button with a pin will clear the memory.

Check button
- Pressing for 1 second will display fault codes.
- Pressing for 5 seconds will reset the indoor unit microprocessor.
- Pressing for 10 seconds will clear only the fault codes.

8.2 Details of the malfunction check display.

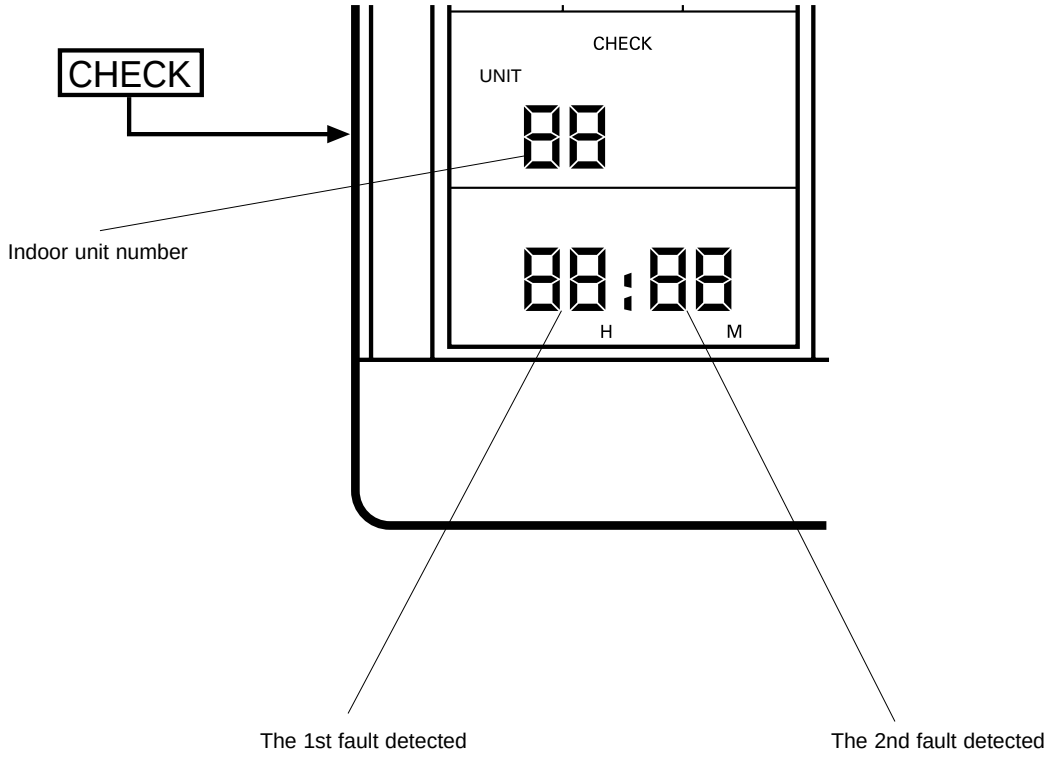
The following fault code display occurs when the check button is pressed for 1 second.

(Note: Up to 16 indoor units can be connected to one remote controller using group control.)

2 fault codes for each of the 16 indoor units can be displayed at 2 second intervals.

Example:

Display for fault codes:



8.3 2-Pipe system fault code summary.

Fault codes can be identified from either the Remote controller, Multi controller or Outdoor unit as shown in the diagram below.

Remote controller fault code			Multi controller display switch position 1			Outdoor Unit	
04	No communication INV to I/F	→	04	No communication I/F to INV	→	No communication I/F to INV	
	No communication M/C to O/D			No communication M/C to O/D		Refer to inverter control board diagnostics	
	No communication I/D to M/C						
0b	Drain pump fault - I/D unit		8A	M/C control board fault			
0C	TA sensor fault		88	No communication initially M/C to O/D		Display switch set to position "8" (LED on)	
0d	TC sensor fault		80	ThA sensor fault	←	LED 1	ThA sensor fault
08	Reverse TC temperature change		81	ThB sensor fault	←	LED 2	ThB sensor fault
09	No TC temperature change		82	ThC sensor fault	←	LED 3	ThC sensor fault
99	No communication I/D to R/C		83	ThD sensor fault	←	LED 4	ThD sensor fault
			84	ThX sensor fault	←	LED 5	ThX sensor fault
15	Refer to M/C	↗	0b	M/C drain pump fault			
"STANDBY" displayed		→	89	I/D capacity rank codes too high	←	LED 6	Over-capacity
			I/D capacity code set to "0"				
						LED 7	M/C 1 fault
						LED 8	M/C 2 fault
						Display switch set to position "3" (LED on)	
1C	Refer to O/D	→	1C	Refer to O/D	→	LED 1	ThD1 sensor fault
						LED 2	ThD2 sensor fault
						LED 3	ThS sensor fault
						LED 4	High pressure fault
						LED 5	Pressure sensor fault
						LED 6	Discharge temperature > 130°C
						LED 7	Suction temperature > 40°C
						LED 8	Low pressure < 0.25kgf/cm²G
14	Refer to O/D	→	14	Refer to O/D	→	Refer to the section on the inverter control board diagnostics	
1d	Refer to O/D	→	1d	Refer to O/D	→		
1F	Refer to O/D	→	1F	Refer to O/D	→		
18	Refer to O/D	→	18	Refer to O/D	→		
21	Refer to O/D Phase rotation incorrect "CHECK" flashing on R/C.	→	21	Refer to O/D	→		

8.4 3-Pipe system fault code summary.

Fault codes can be identified from either the Remote controller, Multi controller or Outdoor unit as shown in the diagram below.

Remote controller fault code			Multi controller display switch position 1			Outdoor Unit	
04	No communication INV to I/F	→	04	No communication I/F to INV	→	No communication I/F to INV Refer to inverter control board diagnostics	
	No communication M/C to O/D			No communication M/C to O/D			
	No communication I/D to M/C					Interface control board. SW1 set to "2", SW2 set to "0". [E] [1] [fault code] Refers to M/C 1 [E] [2] [fault code] Refers to M/C 2	
0b	Drain pump fault - I/D unit		8A	M/C control board fault			
0C	TA sensor fault		88	No communication initially M/C to O/D			
0d	TC sensor fault		80	ThA sensor fault	←	80	ThA sensor fault
08	Reverse TC temperature change		81	ThB sensor fault	←	81	ThB sensor fault
09	No TC temperature change		82	ThC sensor fault	←	82	ThC sensor fault
99	No communication I/D to R/C		83	ThD sensor fault	←	83	ThD sensor fault
			84	ThX sensor fault	←	84	ThX sensor fault
15	Refer to M/C	↗	0b	M/C drain pump fault	←	0b	M/C drain pump fault
"STANDBY" displayed		→	89	I/D total capacity codes too high	←	89	Over-capacity
			I/D capacity code set to "0"				
						[E] [r] [fault code] Refers to O/D	
1C	Refer to O/D	→	1C	Refer to O/D	→	AO	ThD1 sensor fault
						A1	ThD2 sensor fault
						A2	ThS sensor fault
						A4	ThO sensor fault
						A5	ThE sensor fault
						A6	Discharge temperature > 130°C
						A7	Suction temperature > 40°C
						AA	Pressure sensor fault
						Ad	D.O.L. compressor fault
						AE	Low pressure < 0.25kgf/cm²G
14	Refer to O/D	→	14	Refer to O/D	→	Refer to the section on the inverter control board diagnostics	
1d	Refer to O/D	→	1d	Refer to O/D	→		
1F	Refer to O/D	→	1F	Refer to O/D	→		
21	Refer to O/D Phase rotation incorrect "CHECK" flashing on R/C.	→	21	Refer to O/D	→		

8.5 Fault codes displayed at the Remote controller.

Diagnostic Functions			Notes
Fault Code	Symptom	Status of Air Conditioner	
04	SERIAL SIGNAL FAULT Inter-unit communication.	Outdoor unit stops. Indoor unit fan continues.	1. Wiring fault between I/D and M/C, or M/C and O/D Interface control board, or O/D Interface control board and O/D Inverter control board. 2. This fault code is also displayed when the Inverter heat sink TRS thermal switch operates.
06	FLOAT SWITCH OPERATION Indoor unit or Multi controller.	Operation stops for Multi controller fault. Indoor unit fan continues for Indoor unit fault.	1. For an I/D fault, when other I/D units are operating, the O/D unit continues, the relevant M/C PMV closes and the faulty I/D unit fan operation continues. 2. Float switch open circuit. 3. Drain pipe blocked. 4. Drain pump fault.
0C	RETURN AIR TEMPERATURE SENSOR (TA)	Indoor unit fan continues	1. For an I/D fault, when other I/D units are operating, the O/D unit continues, the relevant M/C PMV closes and the faulty I/D unit fan operation continues. 2. Sensor open / short circuit.
0d	INDOOR HEAT EXCHANGER SENSOR (TC)	Indoor unit fan stops. (PREHEAT DEFROST is displayed on R/C)	1. O/D unit stops when the faulty Indoor unit is the only unit operating. 2. Sensor open / short circuit. 3. Check the defrosting of the I/D heat exchanger.
15	MULTI CONTROLLER FAULT	Operation stops	1. Refer to Multi controller diagnostics and fault codes.
1C	OUTDOOR UNIT FAULT	Operation stops	1. Refer to Outdoor unit diagnostics and fault codes.
14	INVERTER FAULT	Operation stops	1. Inverter compressor fault (short circuit). 2. Check the power supply, wiring, fuses, giant transistor, base drive board, smoothing capacitor, rectifier diode and compressor.

Diagnostic Functions			Notes
Fault Code	Symptom	Status of Air Conditioner	
id	INVERTER COMPRESSOR FAULT	Operation stops	1. Inverter compressor fault (overload). 2. Check the power supply, wiring and compressor.
IF	INVERTER MALFUNCTION	Operation stops	1. Fault in the current detection circuit of the Inverter control board. 2. Check the power circuit, wiring, control boards and compressor.
18	OUTDOOR HEAT EXCHANGER SENSOR (TE) 2-Pipe Outdoor unit ONLY.	Operation stops	1. Sensor open / short circuit.
21	HIGH PRESSURE FAULT	Operation stops	1. High pressure switch or Inner over-load relay malfunction. 2. Operation of the High pressure switch or Inner over-load relay, or detected by the Pressure sensor. 3. Possible causes – gas leak, refrigerant under charge or over-load operating conditions. 4. Phase rotation detected at D.O.L compressor start up. "Check" flashes on the Remote controller.
99	REMOTE CONTROLLER COMMUNICATION	Indoor unit stops	1. Wiring fault between the Indoor unit and the Remote controller.

8.6 Fault codes displayed at the Multi controller.

Display switch set to position "1".

Fault code	Fault	Note
80	ThA sensor fault	Sensor open / short circuit.
81	ThB sensor fault	
82	ThC sensor fault	
83	ThD sensor fault	
84	ThX sensor fault	
88	Communication between M/C and O/D	No initial communication between M/C and O/D Check the wiring and control boards.
89	Total I/D capacity codes too high	Fault code is displayed when total I/D capacity exceeds 1.35 times the O/D unit capacity.
8A	Multi controller control board malfunction.	

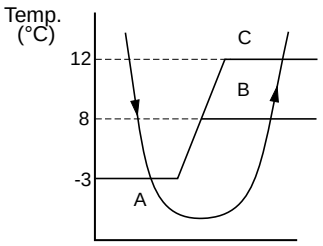
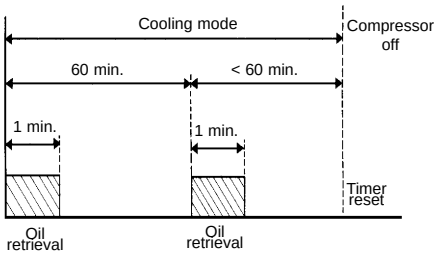
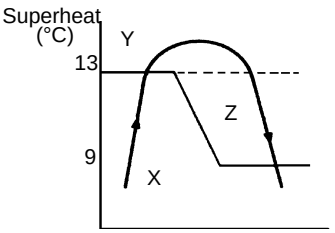
8.7 Fault codes displayed at the Outdoor unit.

2-Pipe : Display switch set to position "3".

3-Pipe : Display switch SW1 set to position "2", SW2 set to position "0".

Fault code		Fault	Note
2-Pipe	3-Pipe		
LED 1	ErA0	ThD1 sensor fault	Sensor open / short circuit.
LED 2	ErA1	ThD2 sensor fault	
LED 3	ErA2	ThS sensor fault	
	ErA4	ThO sensor fault	
	ErA5	ThE sensor fault	
LED 6	ErA6	Discharge temperature fault	Detected by ThD1 and ThD2 > 130°C. Possible cause – gas leak, refrigerant under charge, over-load operating condition, or valve blockage / malfunction.
LED 7	ErA7	Suction temperature fault	Detected by ThS > 40°C. Possible cause – gas leak, refrigerant under charge, over-load operating condition.
LED 5	ErAA	Pressure sensor fault	Open / short circuit, or pressure sensor capillary tube block.
LED 8	ErAE	Low pressure fault	Possible cause – gas leak, refrigerant under charge, over-load operating condition, or valve blockage / malfunction. Detected by low pressure switch. < 0.25kgf/cm^{2}G
LED 4	ErAd	D.O.L. compressor fault	High pressure switch, over-load relay malfunction or phase rotation incorrect.

9. CONTROL FEATURES

NO.	CONTROL	DESCRIPTION	DIAGRAM
1	Defrost (Heating mode) Does not apply to MAR-C104M8-1-PE	• During heating operation, defrost is controlled by the Outdoor unit heat exchanger temperature sensor (TE). • When the cumulative operating time with TE in zone [A] has amounted to 25 minutes, defrost operation starts. Subsequent defrosts occur after a cumulative time of 55 minutes. When heating operation resumes after defrost, the timer is reset. • The maximum defrost period after TE returns to zone [B] is 1 minute. • Heating operation resumes immediately after TE returns to zone [C].	
2	Oil Retrieval (Cooling mode)	• During cooling operation, oil retrieval is performed if one or more Indoor units are OFF. • If this condition is satisfied, when cooling operation commences, oil retrieval takes place for 1 minute. If cooling operation continues, oil retrieval is repeated for 1 minute every 60 minutes. • During oil retrieval the following occurs: a. All Multi controller PMV's are opened. The degree of opening is dependant on the capacity of the Indoor unit . b. If the D.O.L. compressor is OFF the inverter compressor speed increases to SD. • When cooling operation ends the timer is reset.	
3	Superheat control (Cooling mode)	• Superheat is controlled by the Multi controller for cooling operation. The level of superheat is determined by the difference between the evaporator outlet temperature for each Indoor unit (ThA, B, C, D) and the saturation temperature (ThX). • If the superheat of an Indoor unit enters zone [Y], the relevant M/C PMV opens further to compensate for this increase. The degree of additional opening is dependant on the capacity of the Indoor unit. • When zone [Z] is reached the PMV opening is held at the level set in zone [Y]. • When the level of superheat returns to zone [X] the control is cancelled.	

NO.	CONTROL	DESCRIPTION
4	Simultaneous Cooling / Heating operation 3-Pipe ONLY	a. Changeover between cooling and heating operations for each indoor unit. The solenoid valves inside the Multi controller are energised when operation commands are sent from the Indoor units. • SVS valve (suction side) opens for a cooling command. • SVD valve (discharge side) opens for a heating command. b. Determination of the Outdoor unit operation mode and frequency of the compressor. These are determined by the difference between the total requested cooling command frequencies and the total requested heating command frequencies of all Indoor units. c. Outdoor unit refrigerant control during cooling dominant mode. • Refrigerant flow is controlled by PMV2. The degree of opening is controlled by the difference of all requested cooling and heating command frequencies and the compressor operation frequency. This flow control is required to divide cooling exhaust heat appropriately between Indoor units in heating mode and the Outdoor unit heat exchanger. • High pressure control is performed to ensure that the capacity of the Indoor units in heating is maintained. This is controlled by the Outdoor unit fan control and the changeover from the main heat exchanger to the sub heat exchanger. d. Outdoor unit refrigerant control during heating dominant mode. • Superheat control is performed by the Outdoor unit expansion valve. • Evaporating temperature control is performed by the Outdoor unit fan control to ensure that the capacity of the Indoor units in cooling mode is maintained. • Changeover from expansion valve to capillary control is performed when there is a minimal difference between the cooling and heating demands and the heat absorption of the Outdoor unit heat exchanger is low.

10. VALVE & SENSOR FUNCTION AND OPERATION

10.1 Multi controller – Valve functions, 2-Pipe and 3-Pipe.

Symbol	Name of Valve	Description of Function
PMV (A, B, C, D)	Flow rate control valve	This opens to the extent corresponding to the capacity and performance required of each Indoor unit.
Multi controller – Valve functions, 3-Pipe ONLY.		
SVS (A, B, C, D)	Suction gas valve	Opens when commands from the Indoor units requires cooling operation.
SVD (A, B, C, D)	Discharge gas valve	Opens when commands from the Indoor units require heating operation.
SVSS	Pressure reducing solenoid valve	Opens when the number of units in heating operation is reduced (heating to shutdown or cooling).
		Opens when defrost operation starts.
		Opens during oil retrieval control in cooling operation.
SVDD	Pressure increasing solenoid valve	Opens when the number of units in heating operation is increased (shutdown or cooling to heating).
		Opens while control is performed to prevent liquid in discharge pipe from being blocked.
SVH	Superheat solenoid valve	Opens when unit in cooling operation is present.

10.2 Multi controller – Valve operation.

Outdoor Operation Mode	Indoor Operation Mode	SVD (3-Pipe ONLY)	SVS (3-Pipe ONLY)	PMV
Shutdown	Shutdown, fan	OFF	OFF	Fully closed
During operation	Shutdown, fan	OFF	ON	Fully closed
	Cooling	OFF	ON	Rated opening
	Cooling thermo-control OFF	OFF	ON	Fully closed
	Heating*	ON	OFF	Rated opening
	Heating thermo-control OFF*	ON	OFF	Fully closed

* Applies to MAR-M104HTM8-1-PE / MAR-F104HTM8-1-PE only

10.3 Outdoor unit – Valve functions, 2-Pipe and 3-Pipe.

Symbol	Name of Valve	Description of Function
20SF*	4-way reversing valve Cooling operation	OFF: Normal operation. ON: Low load condition when sub heat exchanger is required. Used in combination with SV15 (3-Pipe ONLY).
	4-way reversing valve Heating operation	ON: Normal operation. OFF: Defrost operation.
SV1*	High-pressure release solenoid valve	Heating operation. Energised when TE > 11˚C
SV2	Hot gas bypass solenoid valve	Opens when Pd < 13kgf/cm^{2}G (cooling) (For cooling dominant mode and sub heat exchanger operation Pd < 17kgf/cm^{2}G – 3-Pipe ONLY). Opens when Outdoor ThO < 0˚C (3-Pipe ONLY). Opens for gas balance when compressor stops (2-Pipe ONLY).
SV4	Solenoid valve for D.O.L. compressor startup	Opens when the D.O.L compressor starts for unloading.
PMV1	Cooling bypass flow control valve	Opens when ThD1 or ThD2 > 110˚C. Opens when ThS > 20˚C
Outdoor unit – Valve functions, 3-Pipe ONLY.		
SV5	Gas balance	Opens when compressor stops.
SV13	Cooling solenoid valve	Opens for cooling-only operations.
SV14	Solenoid valve for expansion valve	SV14 opens for heating operation.
SV16	Solenoid valve for capillary	SV16 opens for low load conditions during heating dominant operation.
SV15	Sub heat exchanger solenoid valve	Opens for sub heat exchanger requirement.
PMV2	Outdoor flow control valve	Opens during cooling dominant operation. Degree of opening depending on cooling / heating demands.

* Applies to MAR-M104HTM8-1-PE / MAR-F104HTM8-1-PE only

10.4 Outdoor unit – Valve operation.

For the 2-Pipe MAR-M104HTM8-1-PE only cooling operation, heating operation and valve 20SF are applicable.

Outdoor Operation Mode		20SF	SV15	SV13	SV14	SV16	PMV2
Cooling operation	Outdoor main heat exchanger	OFF	OFF	ON	OFF	OFF	–
	Sub heat exchanger	ON	ON	ON	OFF	OFF	–
Heating operation	–	ON	OFF	OFF	ON	OFF	–
Simultaneous cooling-dominant operation	Outdoor main heat exchanger	OFF	OFF	OFF	OFF	OFF	Opening degree control
	Sub heat exchanger	ON	ON	OFF	OFF	OFF	Opening degree control
Simultaneous heating-dominant operation	Expansion valve	ON	OFF	OFF	ON	OFF	–
	Capillary	ON	OFF	OFF	OFF	ON	–

10.5 Manual operation of valves.

Note: 1. Ensure that the system is OFF before valves are manually operated.

2. Valves will re-assume their required position unless electrically isolated.

a. Multi controller

Display switch position	Valve	Short point	
0	PMV A	TP 1 Selected valve is fully opened for 2 minutes.	TP 2 Selected valve is fully closed for 2 minutes.
1	PMV B		
2	PMV C		
3	PMV D		

b. Outdoor unit – (3-Pipe ONLY)

SW1	SW2	Short Point	Operation	Function
0	N/A	TP1	Valves will automatically assume their required position after two minutes.	PMV 1 fully open for 2 minutes.
1				PMV 2 fully open for 2 minutes.
0		TP2		PMV 1 fully closed for 2 minutes.
1				PMV 2 fully closed for 2 minutes.
2	0	TP3	Push SW04	Solenoid valves manually energised in sequence when pressed
			Press SW03	Solenoid valves automatically energised in sequence (1 second intervals)

10.6 Multi controller sensor operation.

Temperature sensor	According to a difference between the evaporator outlet temperature and (ThA, B, C, D) saturation temperature (ThX): a. Performs Superheat control. (cooling operation) b. Determines the degree of opening of PMV 2. (cooling dominant operation – 3-Pipe ONLY)

10.7 Outdoor unit – Sensor and switch operation.

Discharge pressure sensor	Determines the frequency of the inverter compressor and the ON/OFF status of D.O.L compressor. Controls the Outdoor unit fan operation. Controls the hot gas bypass SV2. Controls the changeover from Outdoor unit main heat exchanger to sub heat exchanger. (MAR-M104HTM8-1-PE / MAR-F104HTM8-1-PE only)	
Suction temperature sensor (ThS)	Controls the degree of opening of PMV 1. Stops operation when ThS > 40°C for 10 minutes.	
Discharge temperature sensor (ThD1, ThD2)	Controls the degree of opening of PMV 1. Stops operation when the discharge temperature > 130°C.	
Outdoor unit heat exchanger sensor (TE) Heating operation	Controls the defrost operation. Controls the Outdoor unit fan operation. Controls the high pressure release valve SV1.	MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE only
Outdoor temperature sensor (ThO) 3-Pipe ONLY	Controls the hot gas bypass SV2. Controls the Outdoor unit fan operation. Prevents heating operation when ThO > 25°C.	MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE only
High pressure switch	Stops operation when Pd > 30kgf/cm^{2}G.	
Low pressure switch	Stops operation when suction pressure < 0.25kgf/cm^{2}G:- • After 30 seconds for cooling operation. • After 10 minutes for heating operation. The low pressure switch is ignored during defrost operation.	MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE only

11. PRESSURE TEST, EVACUATION AND DEHYDRATION

When Multi controllers are delivered from the factory the PMV's are in the fully open position. After power is supplied to the system the PMV's assume their required operating position, including closed. Before performing the pressure test or evacuation ensure that all Multi controller PMV's are in the fully open position as shown in the "Manual operation of valves" (10.5).

11.1 Precautions for R407C Systems

- R407C outdoor units use synthetic oils which are extremely hygroscopic. Therefore ensure that the refrigerant system is NEVER exposed to air or any form of moisture.
- Mineral oils are unsuitable for use in these units and may lead to premature system failure.
- Use only equipment which is suitable for use with R407C. Never use equipment which has been used with R22.
- R407C should only be charged from the service cylinder in the liquid phase. It is advisable to use a gauge manifold set equipped with a liquid sight glass fitted in the centre (entry) port.

11.2 Pressure test.

- Supply oxygen free nitrogen (OFN) gas at a pressure of 30kgf/cm^{2}G to the charge port on the suction gas side service valve.

11.3 Evacuation and Dehydration.

- When removing air and dehydrating refrigerant pipe work use an approved type of vacuum pump, do NOT use refrigerant to purge the air.

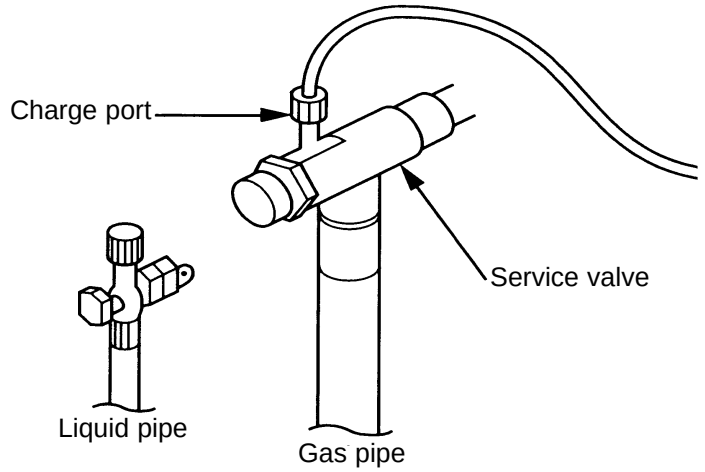
  2-Pipe evacuation positions: Liquid pipe and Gas pipe charge ports.

  3-Pipe evacuation positions: Liquid pipe and Discharge gas pipe charge ports.

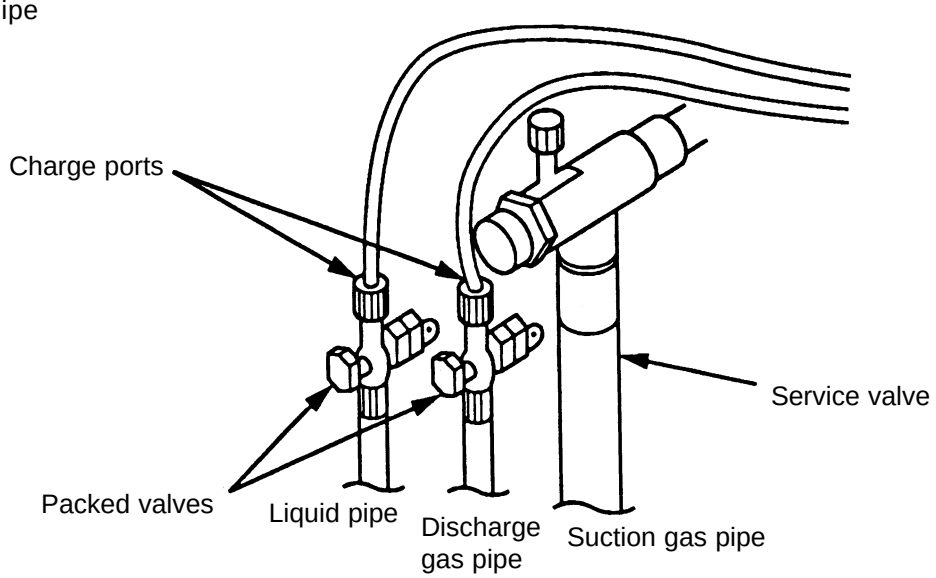
  (Refer to diagrams below).

- Ensure to create a vacuum of -76cmHg at both the Liquid and Gas sides.

2-Pipe



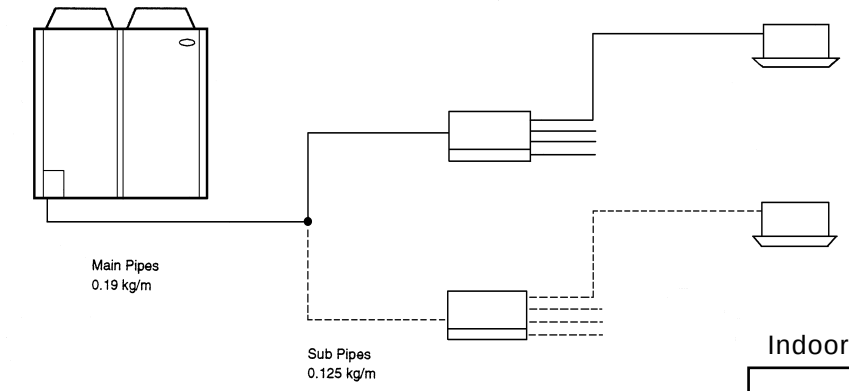
3-Pipe



12. ADDITIONAL REFRIGERANT

- The Super multi outdoor units contain sufficient refrigerant to operate an installation having 5 metres of pipework (when delivered).
- Refer to the diagram below when calculating the amount of refrigerant required, use only HFC 407C.
- The total refrigerant charge must be calculated by the weight, and within a tolerance of ± 50g.
- Prolonged operation with either an overcharge or deficiency in refrigerant will lead to loss of performance, increased running costs and will cause damage to the machine. Warranty will be void.
- The piping length is the actual one way length of the pipe at the liquid side of all branch circuits.
- The initial charge is:

Model	Refrigerant charge
MAR-C104M8-1-PE	9.0 kg
MAR-M104HTM8-1-PE	16.0 kg
MAR-F104HTM8-1-PE	19.0 kg



Indoor unit branch pipes

RAV - 10*	0.030 kg/m
RAV - 13*	0.030 kg/m
RAV - 16*	0.030 kg/m
RAV - 26*	0.045 kg/m
RAV - 36*	0.045 kg/m
RAV - 46*	0.045 kg/m

Example : RAV-464CH-PE ⇒ RAV-46*

Single Multi controller

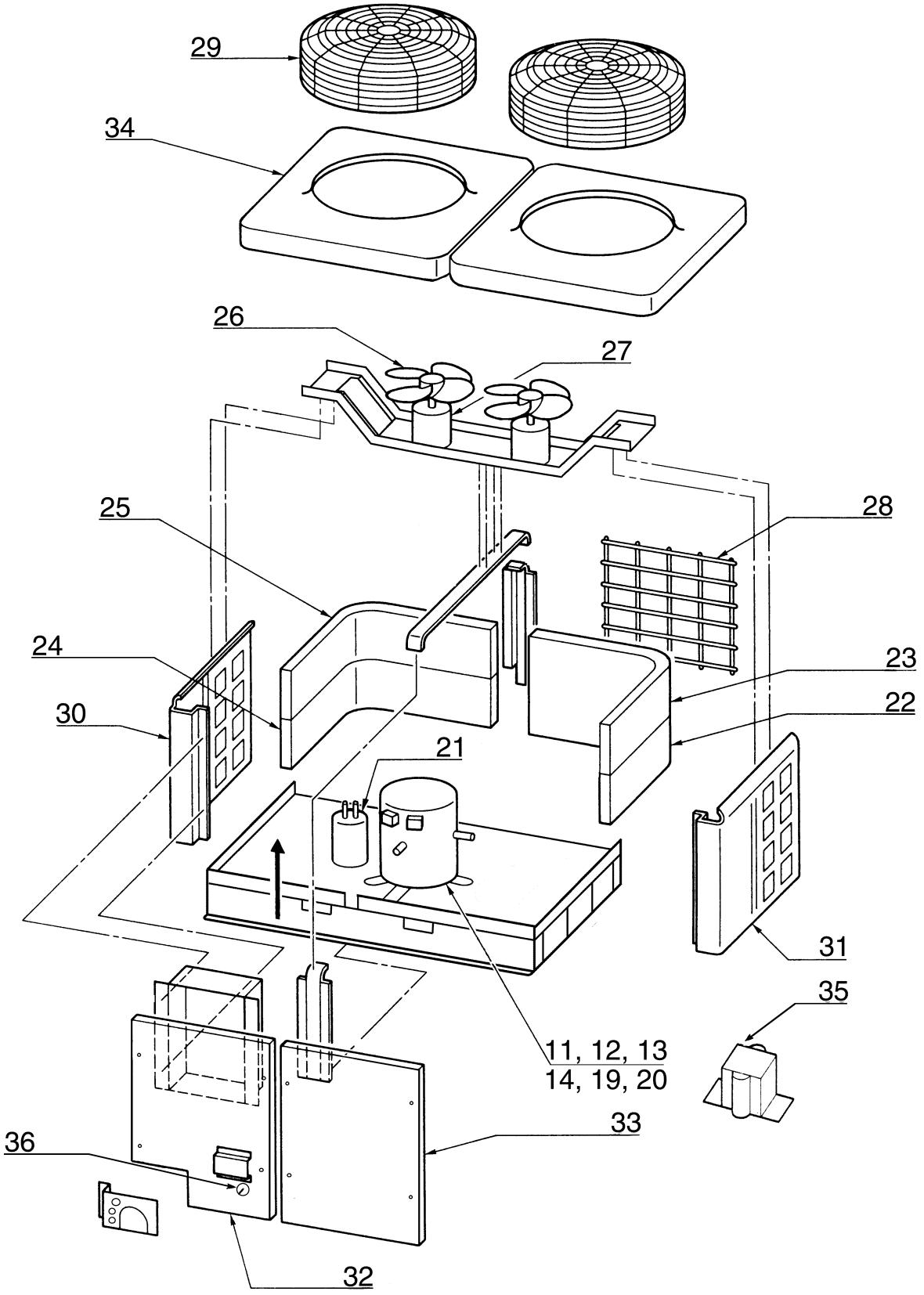
	Main pipe run (minus 3m.)	x	0.190 kg/m	=
	Branch pipe A (minus 2m.)	x	See above table	=
	Branch pipe B (minus 2m.)	x	See above table	=
	Branch pipe C (minus 2m.)	x	See above table	=
	Branch pipe D (minus 2m.)	x	See above table	=
			Total additional gas charge	= _____kg

Two Multi controllers

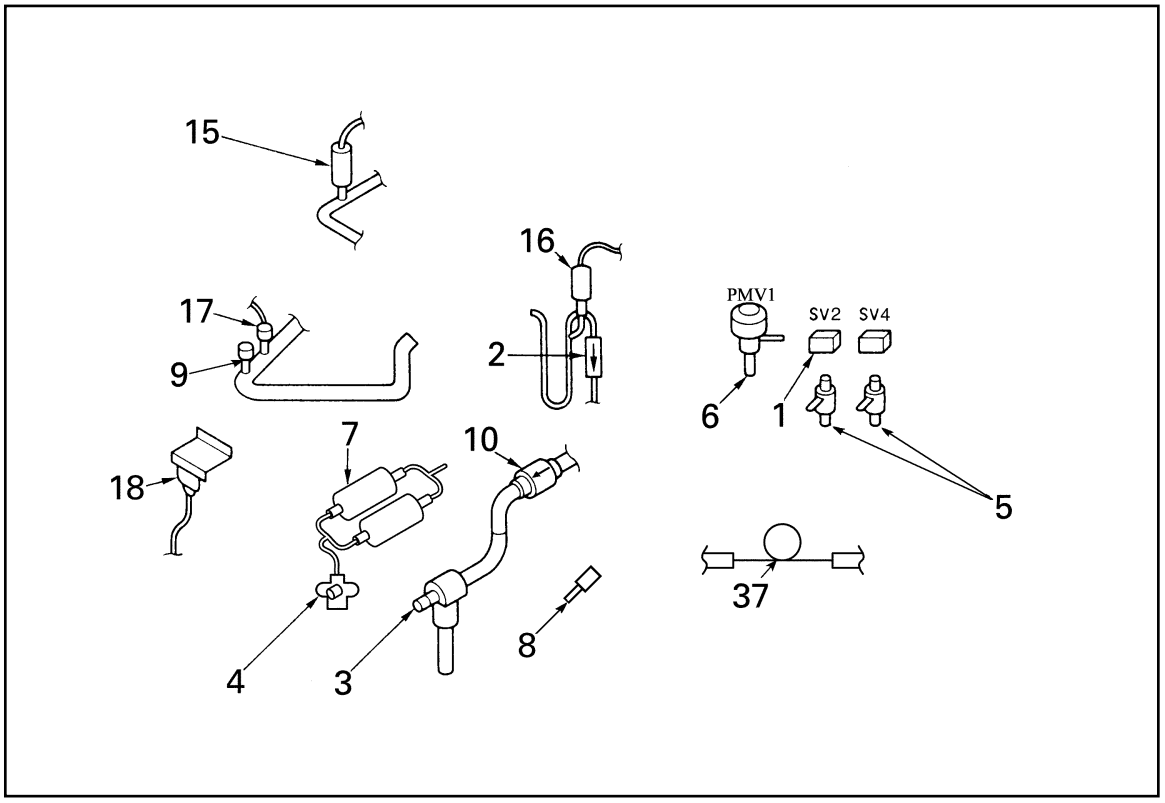
	Main pipe run (minus 2m)	x	0.190 kg/m	=
	Total sub pipe (minus 2m)	x	0.125 kg/m	=
M/C 1	Branch pipe A (minus 2m)	x	See above table	=
	Branch pipe B (minus 2m)	x	See above table	=
	Branch pipe C (minus 2m)	x	See above table	=
	Branch pipe D (minus 2m)	x	See above table	=
M/C 2	Branch pipe A (minus 2m)	x	See above table	=
	Branch pipe B (minus 2m)	x	See above table	=
	Branch pipe C (minus 2m)	x	See above table	=
	Branch pipe D (minus 2m)	x	See above table	=
			Total additional gas charge	= _____kg

13. EXPLODED VIEWS AND SERVICE PARTS LISTS

13.1 Outdoor Unit (MAR-C104M8-1-PE).



13.2 2-Pipe refrigeration assembly parts (MAR-C104M8-1-PE).

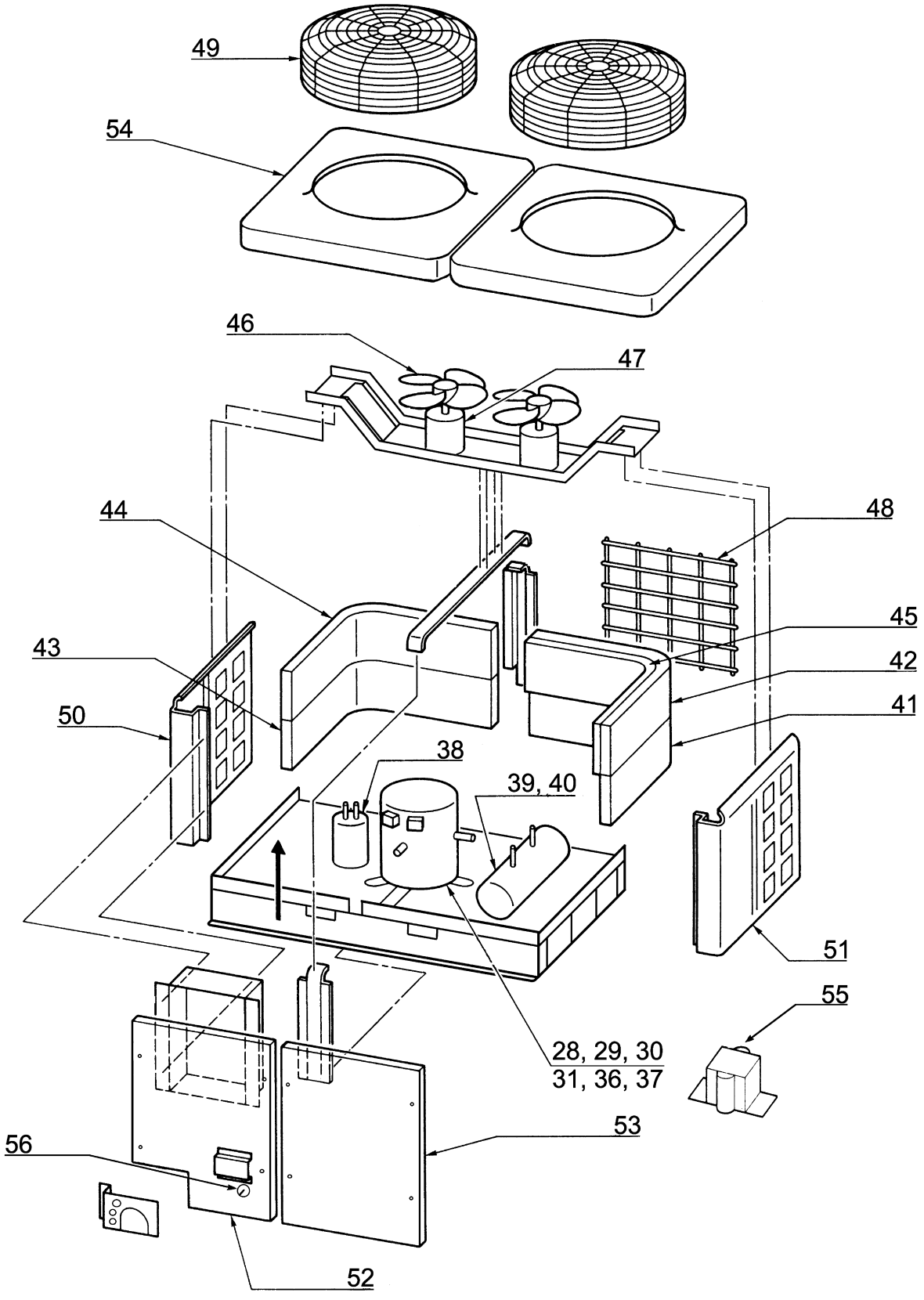


Location No.	Part No.	Description
1	43A46018	Solenoid coil assembly (2 coils: SV2, SV4)
2	43146428	Check valve
3	43146351	Service valve (1 1/8")
4	43146503	Packed valve (5/8")
5	43046151	2-way valve
6	43146526	Pulse modulating valve (EV18RC2)
7*	43A45003	Dryer - XH10*
8	43146383	Check joint
9	43147321	Check joint
10	43147529	Strainer
11	43195185	Cushion, under, compressor
12	43195186	Cushion, upper, compressor
13	43195198	Spacer
14	43107200	Spring, base
15	43146367	Switch, high pressure (20PS-B)
16	43151229	Switch, high pressure (20PS-G)
17	43151230	Switch, low pressure (20PS-1)
18	43146524	Sensor, pressure

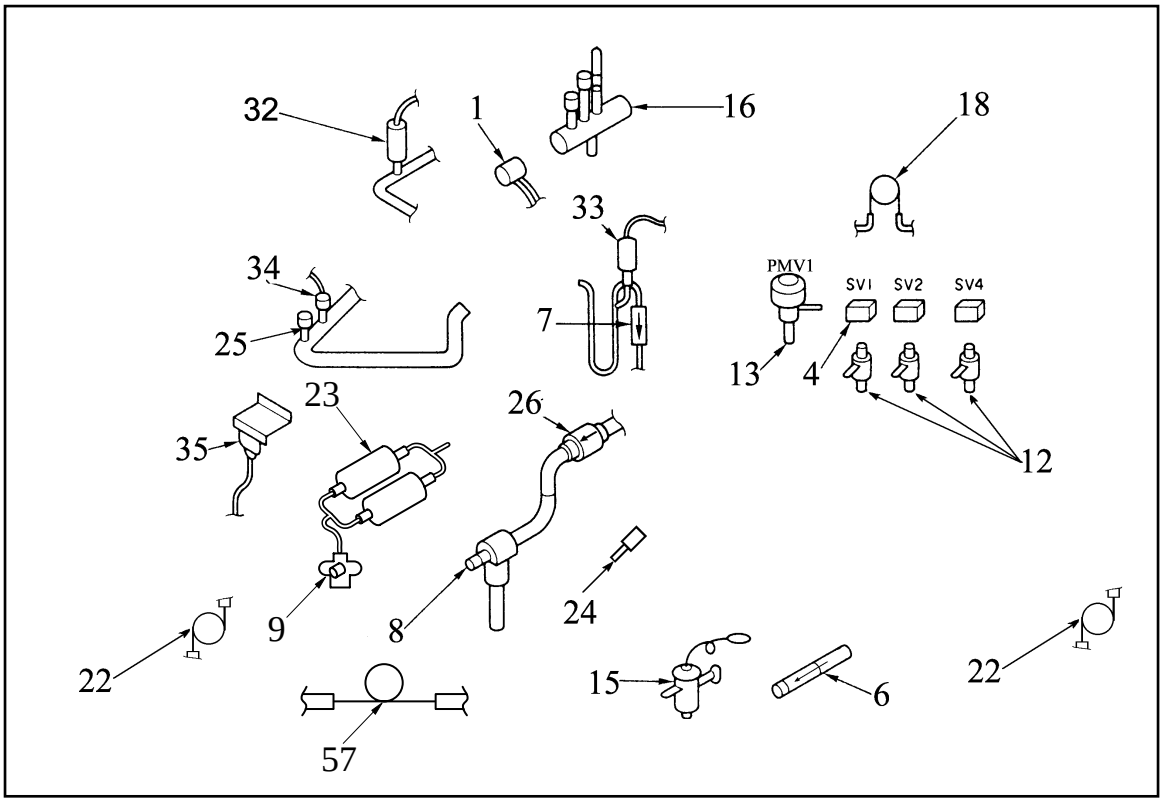
Location No.	Part No.	Description
19	43A41504	Compressor (MG1300CW-20)
20	43157254	Heater, crank case
21	43A48003	Accumulator
22	43A43007	Condenser, right-lower
23	43A43008	Condenser, right-upper
24	43A43009	Condenser, left-lower
25	43A43010	Condenser, left-upper
26	43120170	Propeller fan
27	43121545	Fan motor
28	43A00004	Fin Guard
29	43A19003	Fan Guard
30	43A00006	Side panel L
31	43A00007	Side panel R
32	43A00016	Front panel L
33	43A00009	Front panel R
34	43A00005	Air out cabi
35	43155136	Reactor
36	43A51005	Isolator
37	43A47034	Capillary assembly, Compressor

* Note: Part 7: Replace both dryers at the same time.

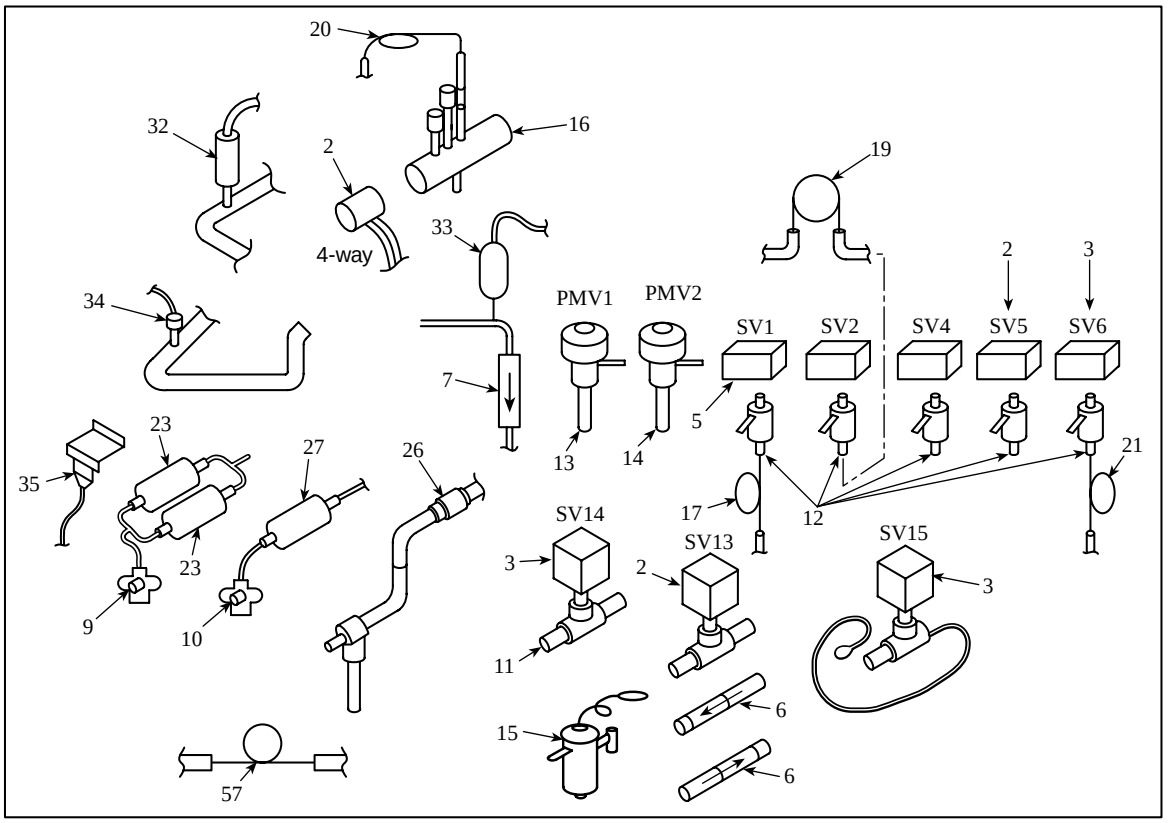
13.3 Outdoor Units (MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE).



13.4 2-Pipe refrigeration assembly parts (MAR-M104HTM8-1-PE).



13.5 3-Pipe refrigeration assembly parts (MAR-F104HTM8-1-PE).

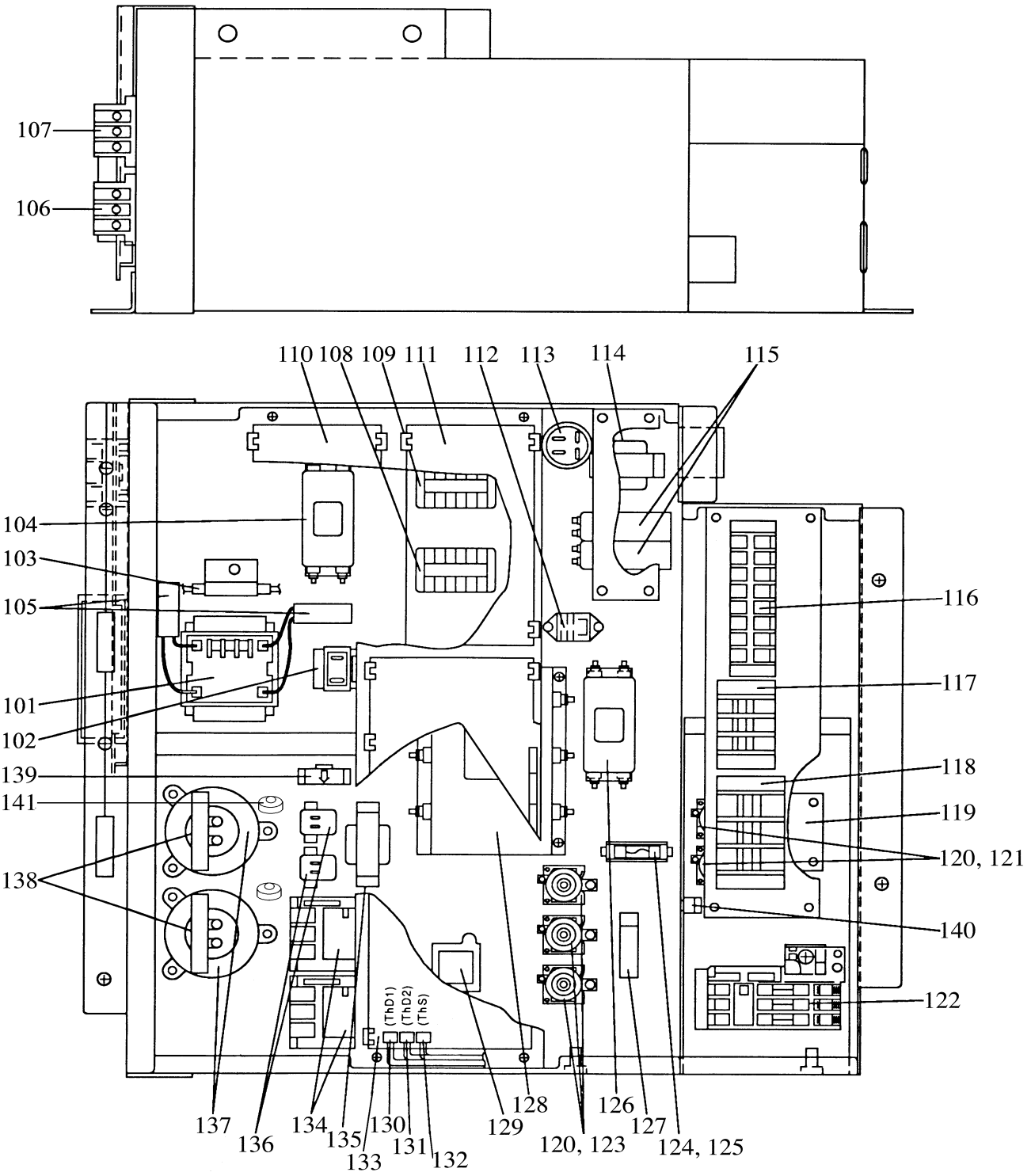


Location No.	Part No.	Description
1	43A46001	Solenoid coil, 4-way valve
2	43A46002	Solenoid coil assembly (3 coils: 4-way, SV5, SV13)
3	43A46003	Solenoid coil assembly (3 coils: SV14, SV15, SV16)
4	43A46005	Solenoid coil assembly (3 coils: SV1, SV2, SV4) 2-Pipe
5	43A46006	Solenoid coil assembly (3 coils: SV1, SV2, SV4) 3-Pipe
6	43146252	Check valve
7	43146428	Check valve
8	43146351	Service valve (1 1/8")
9	43146503	Packed valve (5/8")
10	43146504	Packed valve (3/4")
11	43146398	Valve body
12	43046151	2-way valve
13	43146526	Pulse modulating valve (EV18RC2)
14	43146525	Pulse modulating valve (EV23RC8)
15	43A46010	Expansion valve
16	43A46007	4-way valve
17	43A47024	Capillary assembly
18	43A47025	Capillary assembly
19	43A47026	Capillary assembly
20	43A47027	Capillary assembly
21	43A47028	Capillary assembly
22	43A47035	Capillary assembly bypass
23*	43A45003	Dryer - XH10*
24	43146383	Check joint
25	43147321	Check joint

Location No.	Part No.	Description
26	43147529	Strainer
27	43147537	Strainer
28	43195185	Cushion, under, compressor
29	43195186	Cushion, upper, compressor
30	43195198	Spacer
31	43107200	Spring, base
32	43146367	Switch, high pressure (20PS-B)
33	43151229	Switch, high pressure (20PS-G)
34	43151230	Switch, low pressure (20PS-1)
35	43146524	Sensor, pressure
36	43A41504	Compressor (MG1300CW-20)
37	43157254	Heater, crank case
38	43A48003	Accumulator
39	43A48004	Liquid tank
40	43A60013	Fusible plug
41	43A43007	Condenser, right-lower
42	43A43008	Condenser, right-upper
43	43A43009	Condenser, left-lower
44	43A43010	Condenser, left-upper
45	43A43011	Condenser, sub
46	43120170	Propeller fan
47	43121545	Fan motor
48	43A00004	Fin Guard
49	43A19003	Fan Guard
50	43A00006	Side panel L
51	43A00007	Side panel R
52	43A00016	Front panel L
53	43A00009	Front panel R
54	43A00005	Air out cabi
55	43155136	Reactor
56	43A51005	Isolator
57	43A47034	Capillary assembly, Compressor

*Note: Part 23: Replace both dryers at the same time.

13.6 Outdoor unit electrical parts assembly (MAR-C104M8-1-PE).

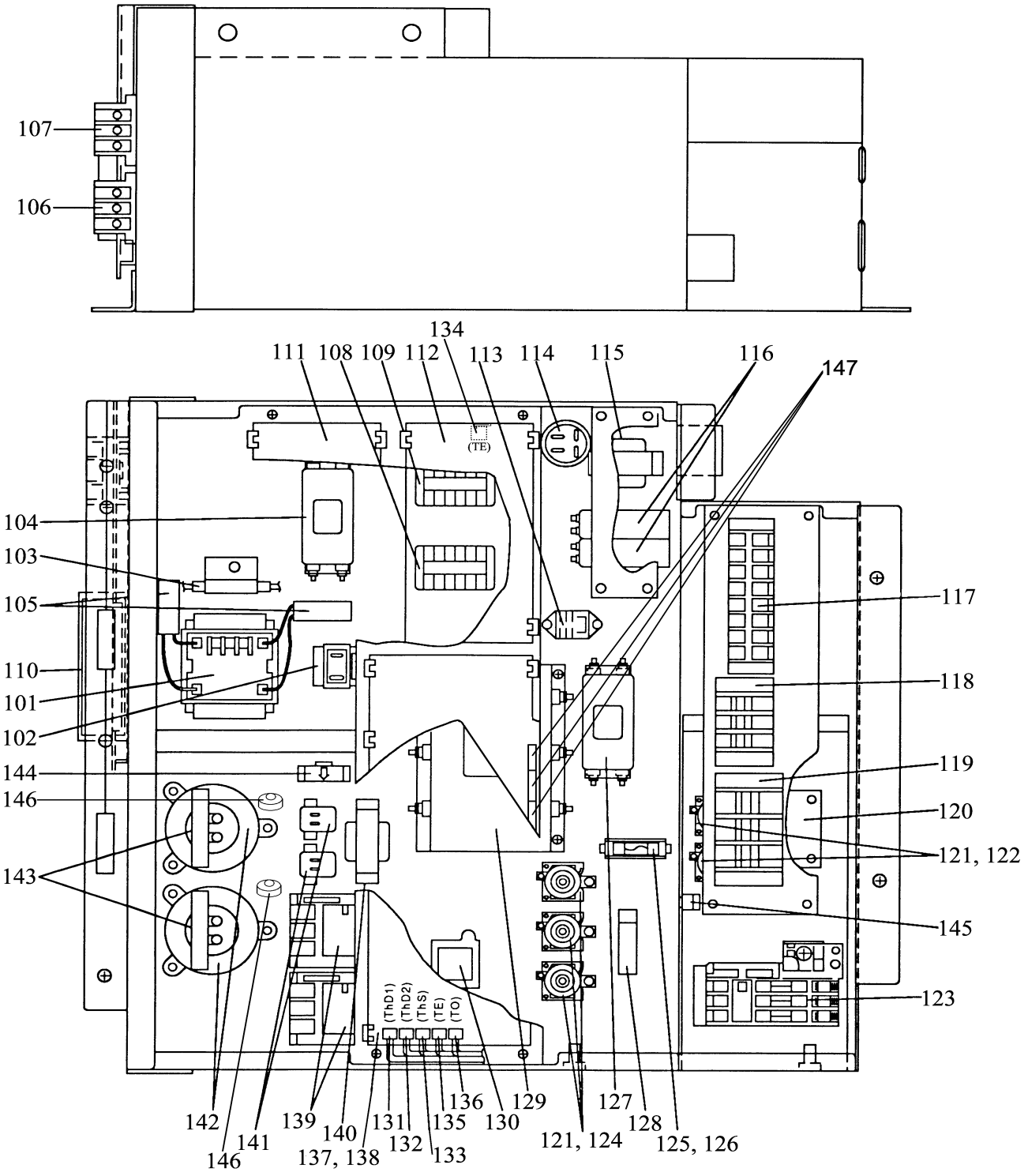


Location No.	Part No.	Description
101	43131031	G-Transistor, MG50Q6ES11
102	4316V028	Diode, SR130G-160
103	43150214	TRS-Thermostat, TRC TR-100B10SPT3A
104	43169617	Noise Filter, DC
105	43169619	Diode Clipper Assembly
106	43160438	Terminal
107	43160450	Terminal, 3P (L1,L2)
108	43160447	Terminal, 6P
109	43160448	Terminal, 6P
110	43169624	PC Board, MCC-1252, Gate
111	4316V025	PC Board, Inverter (2-Pipe) MCC-1251 (INV-M-E) With TE sensor connection
112	43154156	Relay, LY-1F
113	43155135	Noise Filter
114	43158140	Transformer FT70
115	43155134	Capacitor, MF
116	43060492	Terminal Block, 9P
117	43160449	Terminal, 3P (N)
118	43160503	Terminal Block, 3P (L1, L2, L3)
119	43169625	PC Board, MCC-1253, Surge
120	43160451	Holder, Fuse
121	43160452	Fuse

Location No.	Part No.	Description
122	43152412	Magnetic Contactor (Fuji Electric FC-2S, 15A)
123	43160453	Fuse
124	43460526	Fuse
125	43060859	Fuse Block
126	43169618	Noise Filter
127	43169620	Ferrite Core
128	43169616	Noise Filter, AC
129	43154148	Return Lock STR-4AB
130	43150274	Sensor - ThD1
131	43150275	Sensor - ThD2
132	43150271	Sensor - ThS
133	4316V027	PC Board, MCC-1211, Interface (2-Pipe)
134	43152334	Magnetic Contactor
135	43158139	Transformer FT69
136	43169612	Starter
137*	43169621	Capacitor, LNT2G222KSMCTF
138	43169614	SEM Resistor
139	43169615	Hole-CT
140	43055392	Surge Absorber
141	43160493	Clamp Filter

* Note: Part 137: Replace both capacitors at the same time.

(MAR-M104HTM8-1-PE, MAR-F104HTM8-1-PE)

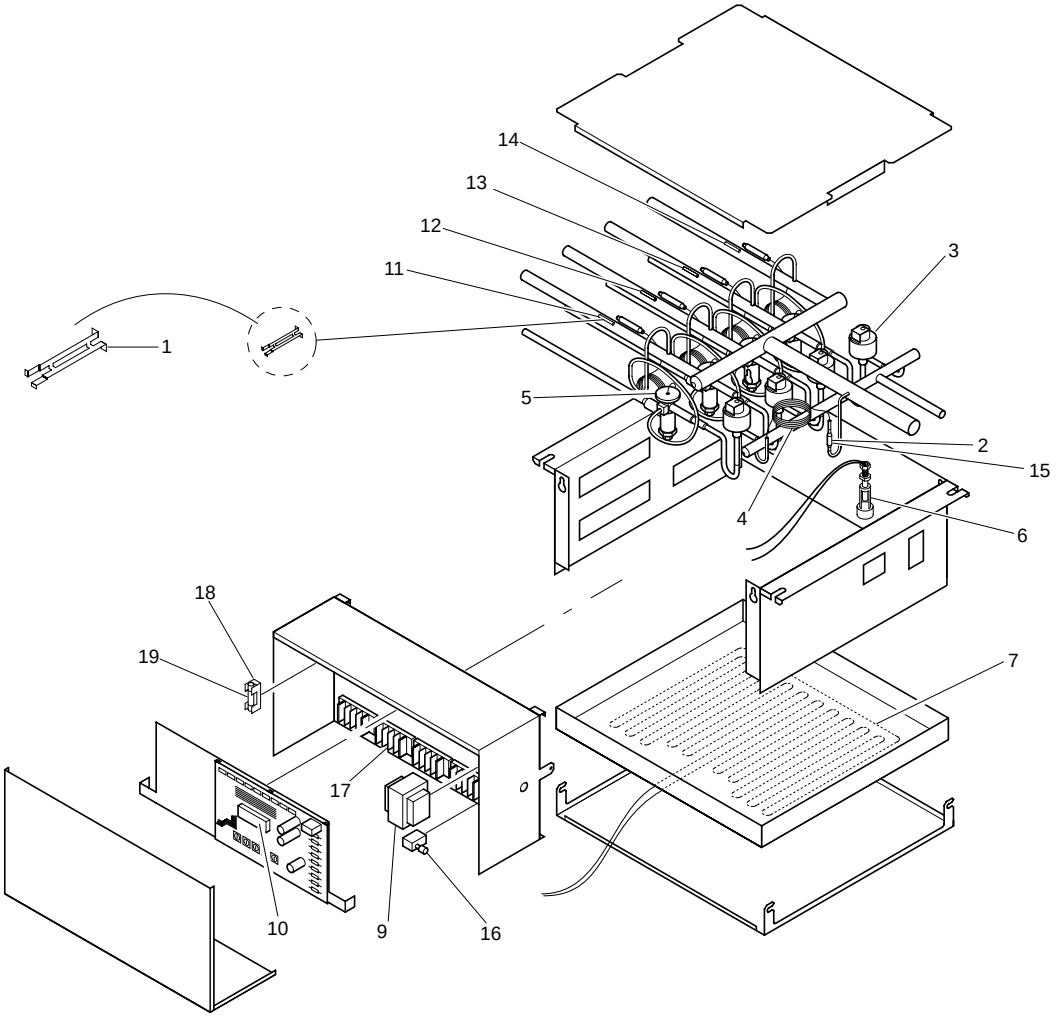


Location No.	Part No.	Description
101	43131031	G-Transistor, MG50Q6ES11
102	4316V028	Diode, SR130G-160
103	43150214	TRS-Thermostat, TRC
		TR-100B10SPT3A
104	43169617	Noise Filter, DC
105	43169619	Diode Clipper Assembly
106	43160438	Terminal
107	43160450	Terminal, 3P (L1,L2)
108	43160447	Terminal, 6P
109	43160448	Terminal, 6P
110	43169613	Fan Motor (3-Pipe)
111	43169624	PC Board, MCC-1252, Gate
112	4316V025	PC Board, Inverter (2-Pipe)
		MCC-1251 (INV-M-E)
		With TE sensor connection
112	43169623	PC Board, Inverter (3-Pipe)
		MCC-1251 (INV-F-E)
113	43154156	Relay, LY-1F
114	43155135	Noise Filter
115	43158140	Transformer FT70
116	43155134	Capacitor, MF
117	43060492	Terminal Block, 9P
118	43160449	Terminal, 3P (N)
119	43160503	Terminal Block, 3P (L1, L2, L3)
120	43169625	PC Board, MCC-1253, Surge
121	43160451	Holder, Fuse
122	43160452	Fuse
123	43152412	Magnetic Contactor
		(Fuji Electric FC-2S, 15A)
124	43160453	Fuse
125	43460526	Fuse

Location No.	Part No.	Description
126	43060859	Fuse Block
127	43169618	Noise Filter
128	43169620	Ferrite Core
129	43169616	Noise Filter, AC
130	43154148	Return Lock STR-4AB
131	43150274	Sensor - ThD1
132	43150275	Sensor - ThD2
133	43150271	Sensor - ThS
134	43150273	Sensor - TE (2-Pipe)
135	43150265	Sensor - TE (3-Pipe)
136	43150272	Sensor - ThO (3-Pipe)
137	4316V027	PC Board, MCC-1211,
		Interface (2-Pipe)
138	43169628	PC Board, MCC-1223,
		Interface (3-Pipe)
139	43152334	Magnetic Contactor
140	43158139	Transformer FT69
141	43169612	Starter
142*	43169621	Capacitor,
		LNT2G222KSMCTF
143	43169614	SEM Resistor
144	43169615	Hole-CT
145	43055392	Surge Absorber
146	43160493	Clamp Filter
147	43155100	Capacitor (3-Pipe)

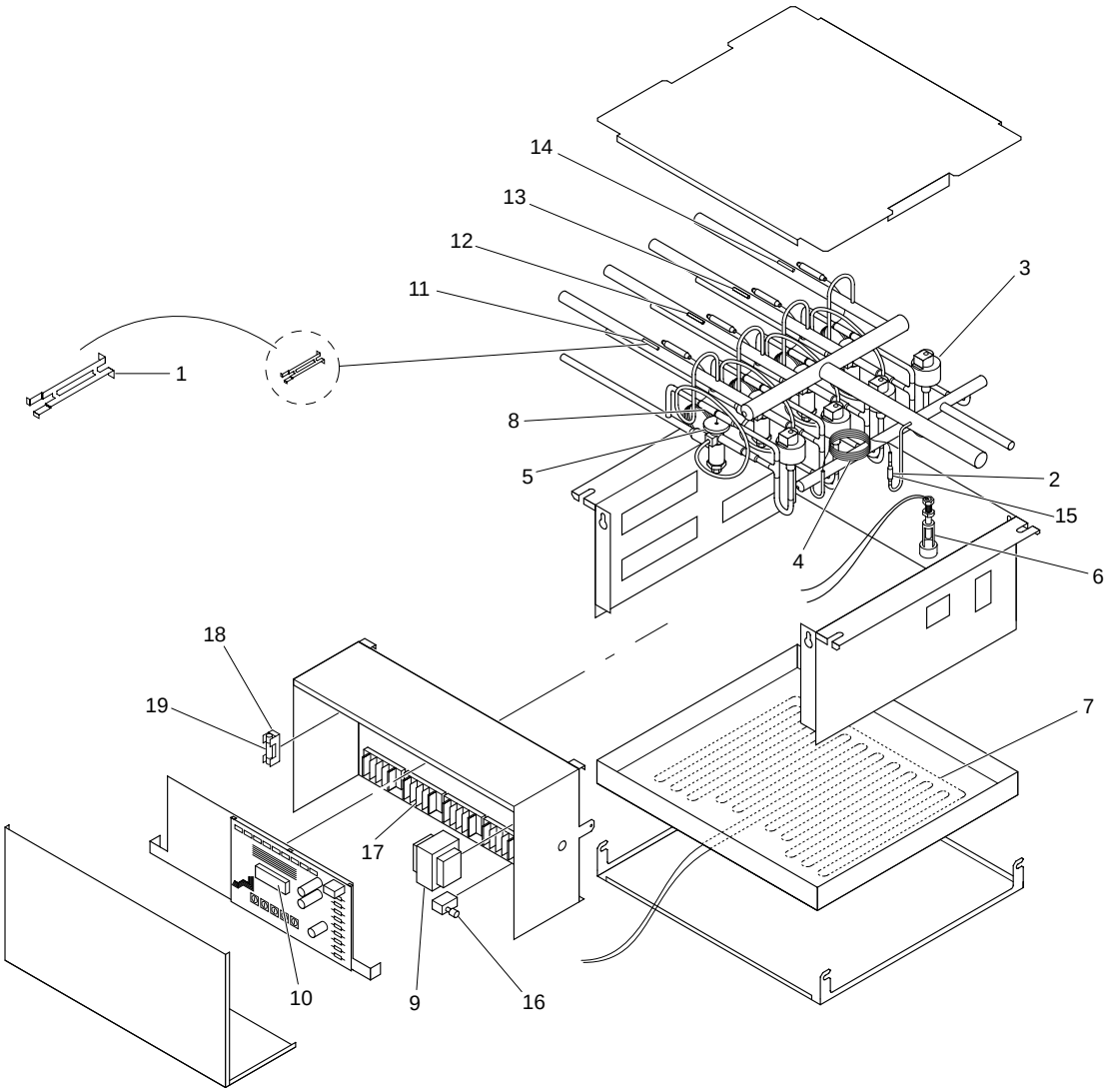
*Note: Part 142: Replace both capacitors at the same time.

13.7 2-Pipe Multi controller (RBM-Y1034C-PE, RBM-Y1044C-PE).



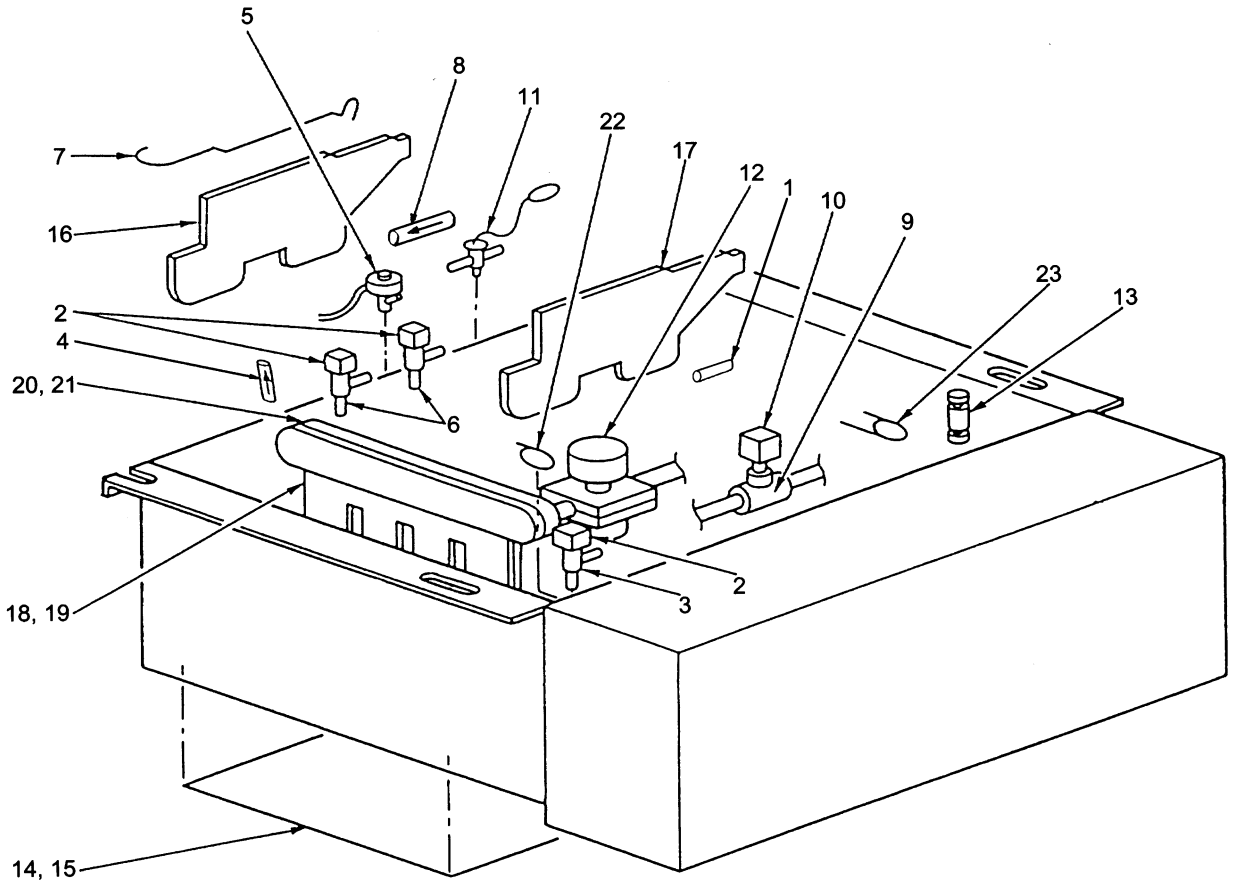
Ref No.	Part No.	Description	Model
1	43107215	Holder, Sensor	All
2	43A47019	Strainer	All
3	43046269	Pulse Motor Valve	All
4	43A47018	Capillary Tube Assembly	All
5	43A6011	Expansion Valve	All
6	43151231	Float Switch	All
7	43157252	Panel Heater	RBM-Y1044C-PE
7	43157253	Panel Heater	RBM-Y1034C-PE
9	43158139	Transformer	All
10	43A69014	PC Board Assembly (CO)	All
11	43150162	Sensor ThA (white)	All
12	43150163	Sensor ThB (red)	All
13	43150164	Sensor ThC (blue)	All
14	43150165	Sensor ThD (black)	RBM-Y1044C-PE
15	43150166	Sensor ThX (green)	All
16	43151242	Micro Switch	All
17	43A60001	Terminal Block	All
18	43A60008	Fuse	All
19	43A60007	Fuse Holder	All

13.8 2-Pipe Multi controller (RBM-Y1034-1-PE, RBM-Y1044-1-PE).



Ref No.	Part No.	Description	Model
1	43107215	Holder, Sensor	All
2	43A47019	Strainer	All
3	43046269	Pulse Motor Valve	All
4	43A47018	Capillary Tube Assembly	All
5	43A6011	Expansion Valve	All
6	43151231	Float Switch	All
7	43157252	Panel Heater	RBM-Y1044-1-PE
7	43157253	Panel Heater	RBM-Y1034-1-PE
8	43146283	Check Valve	All
9	43158139	Transformer	All
10	4316V026	PC Board Assembly	All
11	43150162	Sensor ThA (WHITE)	All
12	43150163	Sensor ThB (RED)	All
13	43150164	Sensor ThC (BLUE)	All
14	43150165	Sensor ThD (BLACK)	RBM-Y1044-1-PE
15	43150166	Sensor ThX (GREEN)	All
16	43151242	Micro Switch	All
17	43A60001	Terminal Block	All
18	43A60008	Fuse	All
19	43A60007	Fuse Holder	All

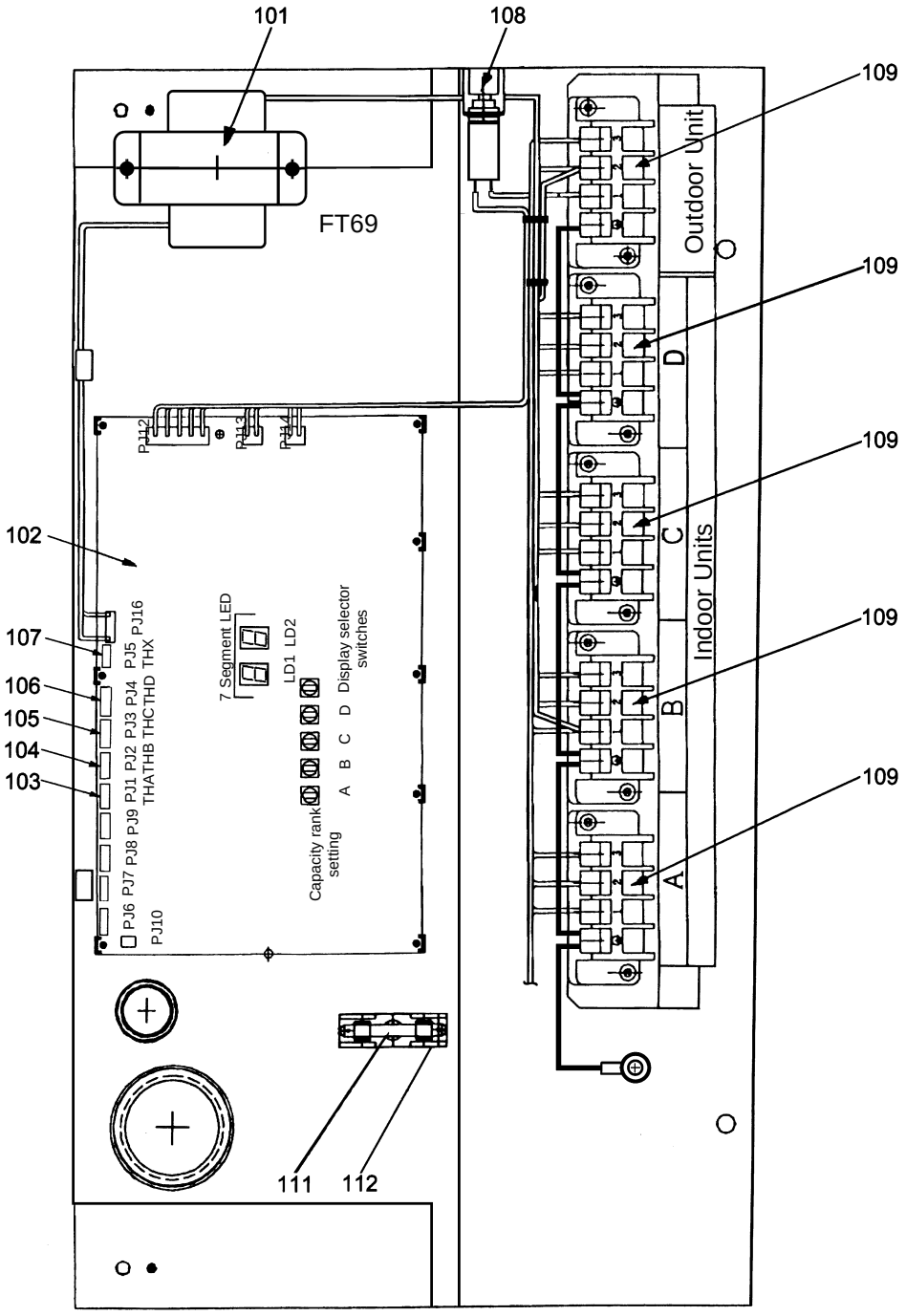
13.9 3-Pipe Multi controller (RBM-Y1034F-PE, RBM-Y1044F-PE).



Location No.	Part No.	Description
1	43107215	Holder, Sensor
2	43146443	Solenoid coil
3	43046151	2 way valve
4	43046156	Check valve
5	43046269	Pulse modulating valve
6	43046270	2 way valve
7	43847010	Capillary tube 2.0 diameter
8	43146283	Check valve
9	43146398	Valve body
10	43146506	Solenoid coil
11	43A46011	Expansion valve
12	43146505	2 way valve
13	43151231	Float switch
14	43157252	Panel heater (RBM-Y1044F-PE)

Location No.	Part No.	Description
15	43157253	Panel heater (RBM-Y1034F-PE)
16	43189026	Insulator, liquid A
17	43189027	Insulator, liquid B
18	43189028	Insulator, header A (RBM-Y1044F-PE)
19	43189029	Insulator, header A (RBM-Y1034F-PE)
20	43189031	Insulator, header B (RBM-Y1044F-PE)
21	43189032	Insulator, header B (RBM-Y1034F-PE)
22	43A47011	Capillary tube 0.8 diameter
23	43A47012	Capillary tube 1.0 diameter

13.10 2-Pipe Multi controller electrical parts assembly (RBM-Y1034C-PE / RBM-Y1044C-PE / RBM-Y1034-1-PE / RBM-Y1044-1-PE).

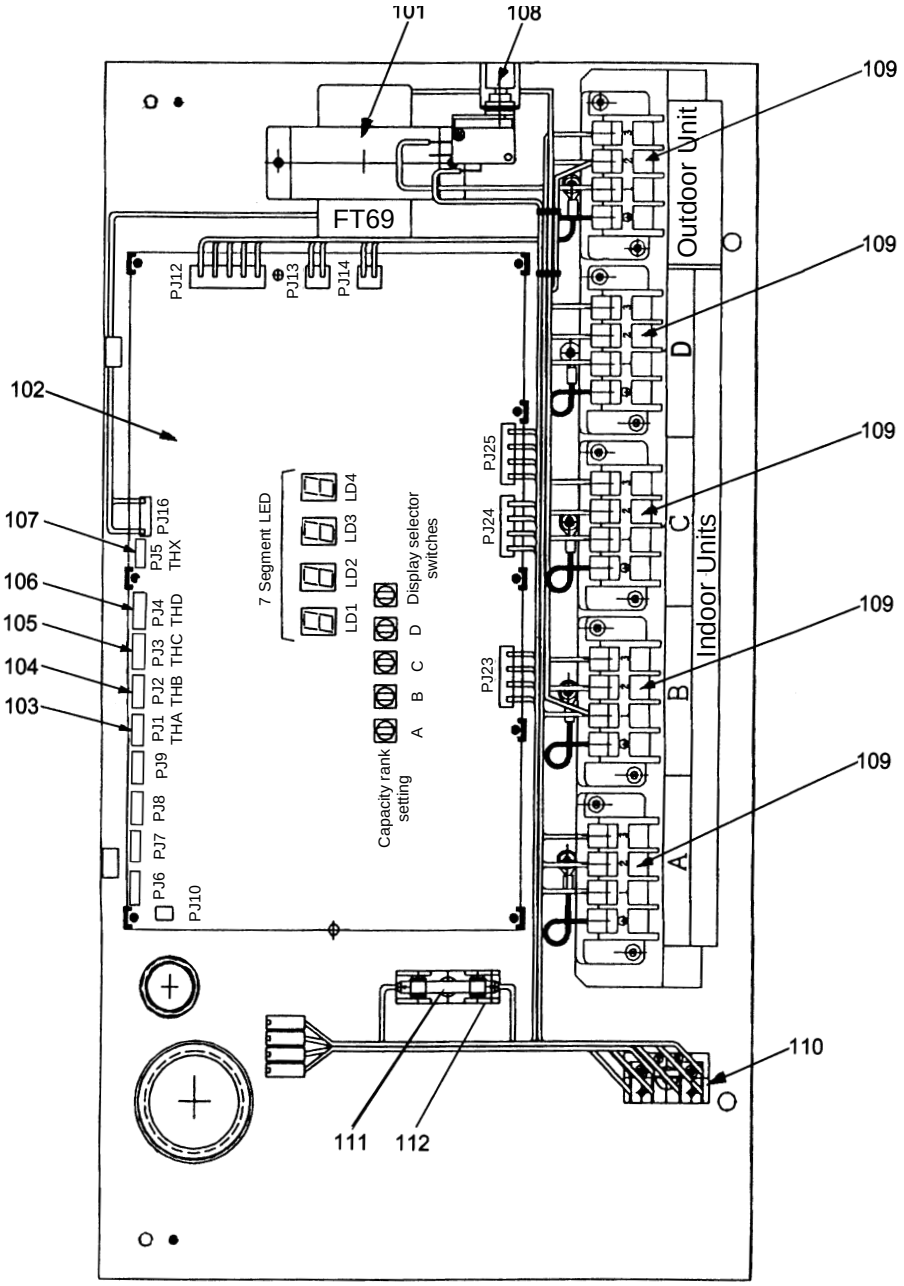


Note: Terminal D is present on RBM-Y1044-1-PE and RBM-Y1044C-PE unit only.

Location No.	Part No.	Description
101	43158139	Transformer (1401008301)
102	4316V026	PC board assembly (MCC-1210)
102	43A69014	PC board assembly (CO)
103	43150162	Sensor (ThA)
104	43150163	Sensor (ThB)
105	43150164	Sensor (ThC)

Location No.	Part No.	Description
106	43150165	Sensor (ThD) (RBM-Y1044-1-PE)
107	43150166	Sensor (ThX)
108	43151242	Micro-switch
109	43A60001	Terminal block 4P
111	43A60008	Fuse T1A
112	43A60007	Fuse holder

13.11 3-Pipe Multi controller electrical parts assembly (RBM-Y1034F-PE, RBM-Y1044F-PE).



Note: Terminal D is present on RBM-Y1044F-PE unit only.

Location No.	Part No.	Description
101	43158139	Transformer (1401008301)
102	43169627	PC board assembly (MCC-1222)
103	43150162	Sensor (ThA)
104	43150163	Sensor (ThB)
105	43150164	Sensor (ThC)
106	43150165	Sensor (ThD) (RBM-Y1044F-PE)

Location No.	Part No.	Description
107	43150166	Sensor (ThX)
108	43151242	Micro-switch
109	43A60001	Terminal block 4P
110	43060776	Terminal block 2P
111	43A60008	Fuse T1A
112	43A60007	Fuse holder

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